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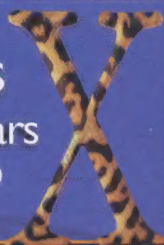


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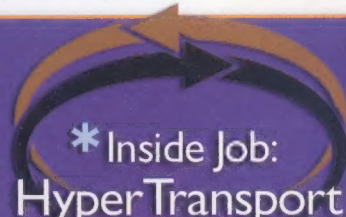


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- ▶ Kyle Bennett
- ▶ Chris Pirillo
- ▶ Pete Loshin
- ▶ Lisa Lopuck
- ▶ Rob "CmdrTaco" Malda
- ▶ Joan Wood
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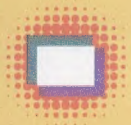


Insane Motherboard Chipset Roundup

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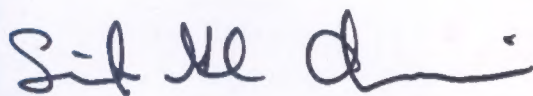
GREETINGS FROM SAMITLAND

Hey, we're fast coming up on *CPU*'s one-year anniversary. My, my, how time flies. We've been taking your feedback to heart and as a result, the magazine's been growing and our quality has improved. Also, don't forget to stop by www.cpumag.com. That's right, we finally launched v1.0 of our Web site. Please check out the site, our forums, and continue to give us feedback. Remember, we measure much of our progress by your feedback on the magazine (and now Web site). I'm not sure if you realize this, but buying a subscription to the mag will give you full access to electronic versions of every issue of *CPU* in addition to our monthly bonus Web content. You'll also get a sneak peek at articles featured in the coming month's issue. Visit the site, take a look, and post feedback in the forums. That way our Web folks will hear back from you first-hand.

At any rate, I've been married for less than five days (just over a month as you read this). And as you may have noticed on the daily *CPU* blog (found at www.cpumag.com [gratuitous plug]), I got married on Sept. 13, 2002. The secret location was Estes Park, Colo. Julie and I held our reception at a place called the Stanley Hotel (www.stanleyhotel.com). Many of you will remember it as the building from "The Shining." Friday the 13th at "The Shining" hotel? Hmmm. Although I'd love to say we planned it this way, it was a coincidence. Word to the wise: The ol' "Redrum" jokes are wearing thin (or sso I've been told). Come Dec. 17, my wife and I will be off to Kolkata, India for the Indian wedding ceremony. Then we're all done with weddings and can just take things easy. Wish us luck!

Hey, for those of you who are married, does the extra weight on your ring finger cause typing errors? I seem to be having some difficulty lifting my finger off the "S" key when I type. Guess it's back to the gym for this ol' married man.

All right folks, thanks for taking the time to read the mag. Keep your feedback coming, and I look forward to seeing you back here next month.



Samit G. Choudhuri, Publication Editor, *CPU*



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In Hardware . . .

Videocassette Format War Officially Ends (Duh!)

Sony announced in late August it would stop making Betamax VCRs by the end of 2002. Betamax is the rival videocassette format to VHS . . . if you can call it a rivalry anymore.

Both videocassette formats, which are aimed at the home market, debuted in the mid-1970s. Although Betamax, released in 1975, had nearly a one-year head start on VHS, it took only a few years for VHS to establish market dominance. Sony's decision to begin manufacturing VHS VCRs in 1988 along with Betamax essentially doomed the Betamax format. It's been several years since Betamax cassettes or VCRs have appeared on most store shelves in the United States.

Officially, Sony says that it was a desire to concentrate on DVDs, not the popularity of VHS, that led to its decision to end Betamax manufacturing. ▲

- 1975** Sony unveils first VCR, using Betamax format.
- 1976** First VHS VCRs hit market.
- 1981** Betamax format owns only 25% of market.
- 1984** Betamax VCR annual sales peak at 2.3 million.
- 1987** Consumers have bought 20 million Betamax VCRs.
- 1988** Sony begins offering VHS-format VCRs.
- 2001** Sony makes only 2,800 Betamax VCRs in Japan.

IBM Wants To Be A Playa'

Hard-core gamers who can't wait for Sony to roll out its PlayStation 3 gaming console appear to have at least one tech giant on their side. Although the company hasn't made any public statements about the matter, internal documents hint that IBM execs apparently are worried that the potential success of Sony's

online gaming efforts with the PS2 (see "Console Wars Move To 'Net" in the Internet section of this article) could extend the shelf life of PS2 and delay introduction of PS3.

IBM, Sony, and Toshiba are working together to develop the processor that will power PS3. Although specific details have been sketchy, the processor is expected to employ grid computing technology. Not surprisingly, IBM would like to see PS3 come to market as quickly as possible. PS3 should initially appear around 2005. IBM already powers Nintendo's GameCube console with the PowerPC Gekko processor. ▲



IBM is closely monitoring the shelf life of Sony's PS2 gaming console.

Forget Gigs, Give Me Pets

Advances in astronomy and life science research will soon push data storage demands to almost unfathomable levels, and experts say gigabytes will be child's play by the end of the decade. Astronomers and life scientists will need hundreds of petabytes (about 1 million gigabytes or 1,024 terabytes) to store data.

Although life scientists, who store 3D images of DNA and complex body organs, and astronomers, who store comprehensive digital images from space, will be the primary beneficiaries of astronomically large storage capacities, Internet companies that routinely perform data mining will appreciate the advances, too. Google, Yahoo!, and AOL are among a handful of companies that already need more than 1 petabyte of data storage. Improvements in massive data storage options should drive down costs for those companies. ▲

Complex images from space, such as this Hubble Telescope image from the Orion Nebula, will soon require massive amounts of storage data, pushing data storage demands to unprecedented levels.

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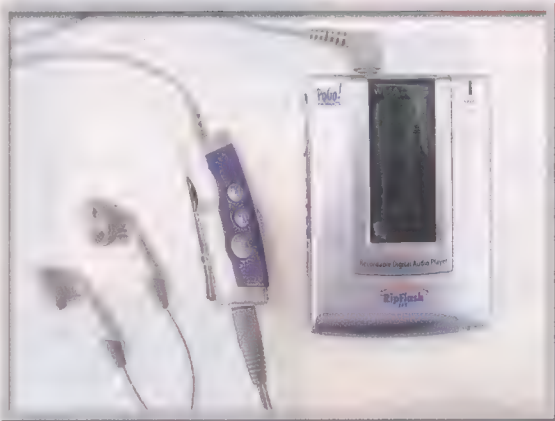
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PoGo! Rips WMA

Ripping digital music isn't all about MP3s any more. PoGo! Products recently introduced its RipFlash DX digital music player—the first to permit encoding in WMA. The RipFlash DX (\$219) includes 128MB of internal memory along with an expansion slot for MultiMedia or Secure Digital cards. The device can record audio directly from several sources, including your stereo or your PC (through a USB connection) in the WMA format, although a computer isn't required.

The RipFlash DX automatically senses the pauses between songs on a CD and begins a new file. You can play back the captured audio directly from the RipFlash DX, which is similar in size to a deck of cards. The RipFlash DX can play either WMA or MP3 files, but it cannot rip MP3 files. ▲



Hardware Mole

Our endearingly myopic hardware mole always has one ear to the ground. Here's his scuttlebutt at press time.

Honey, I Shrunk The Chips Again

An April 2002 alliance among Motorola, Philips, and STMicroelectronics apparently has needed only a few months to achieve success. Soon, the three companies will each introduce CMOS chips that will be the first to use a 0.09-micron (90-nanometer) manufacturing process. Because of the high costs of fabricating 0.09-micron chips, the alliance lets all three companies save money in research and development. The 0.09-micron chips provide smaller circuits than the 0.13-micron chips commonly others, such as Intel, make. (Intel is planning a 0.09-micron chip by mid-2003.) The alliance hopes to manufacture a 0.032-micron chip before the partnership expires in 2007.

Blue-Laser Competition Heats Up

The Blu-ray Disc standard, a high-capacity optical disc storage solution that uses blue lasers, apparently has some strong competition. Sony, Matsushita Electric, and others introduced the Blu-ray standard in February 2002, hoping to take control of the blue-laser

market for optical discs.

However, Toshiba and NEC recently came up with their own yet-to-be-named blue-laser standard, which is compatible with the currently available red-laser DVD standards, unlike Blu-ray Disc. Consequently, the Toshiba standard isn't



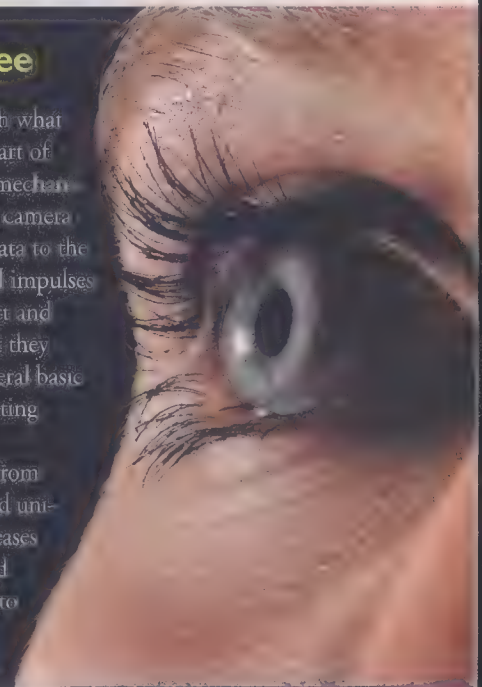
compatible with Blu-ray Disc, either, which could further fragment the optical disc market. Blue-laser discs offer several times more storage capacity than red-laser discs.

Miracle Chip: Helping Blind Patients See

A team of experts is working on a project that could accomplish what many thought was impossible: help the blind see again. As part of the project research, a chip containing 1,000 MEM (microelectromechanical systems) electrodes would be inserted on the patient's retina. A camera and transmitter inside the patient's glasses would transmit visual data to the chip, which would use retinal nerves to transmit electrical impulses to the brain. Images wouldn't be perfect and would contain about 1,000 pixels, but they should let blind patients perform several basic functions, including reading and getting around objects in the house.

This chip, when inserted on the retina, may help blind patients to see.

The project, which involves researchers from national laboratories, private companies, and universities, hopes to help those blinded by diseases such as age-related macular degeneration and retinitis pigmentosa, where the neural paths to the brain remain mostly intact. ▲

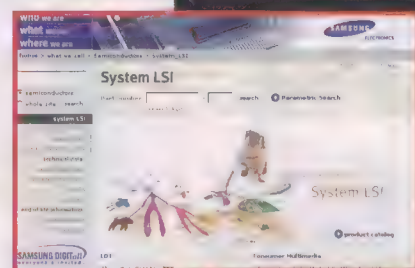


What's Happening **Chip Watch**

To continue the tradition established way back in July 2002, we bring you a page of the choicest chip news. Enjoy!

Samsung Challenges Intel, TI

Samsung Electronics plans to battle directly with companies such as Intel and Texas Instruments before the end of the decade in developing specialized system chips. The South Korean company plans to spend \$3.6 billion in research and development during the next five years in an effort to boost sales of system LSI (large scale integrated circuit) chip products, also called SOC (system on chip) products. Samsung hopes to become an industry leader in several product categories, including optical disc chipsets and smart card ICs. Analysts say demand for system LSI products—used in digital televisions, mobile phones, home appliances, and other products—should grow strongly in the next few years.



Samsung hopes a large research and development budget will increase its market share of system LSI chip products.

AMD Criticizes SYSmark2002

Advanced Micro Devices, unhappy with benchmark results for its microprocessors, has accused those operating the SYSmark2002 benchmark of altering the standard to favor Intel-brand processors. When comparing processors, consumers often look to benchmarks, such as SYSmark2002, seeking an objective comparison of performance. But AMD says objectivity isn't part of SYSmark2002, released in January 2002. BAPCo, a consortium consisting of many tech heavyweight companies (including Intel) distributed the SYSmark2002 benchmark. AMD, which joined BAPCo in July 2002 to gain input into future benchmarks, says that after its processors outperformed Intel processors under the SYSmark2001 benchmark, the 2002 version eliminated several tests that gave AMD the advantage. Intel has responded by saying other 2002 benchmarks also have favored Intel chips.



Intel's Springdale Chipset Samples Available

Intel reportedly is making samples of its Springdale-core chipsets available to mobo manufacturers, meaning the company remains on track to release its Prescott-core P4 processors in the first half of 2003. The Springdale chipset will be a key component of the Prescott P4 processors.

Intel also apparently has decided to include its HyperThreading technology in all P4 chips that run at clock speeds of greater than 3.06GHz. Intel hopes HT, which lets one processor work similarly to a dual-processor system, will better enable P4 chips to compete with AMD processors.



Watching The Chips Fall

Here's a rundown of the latest AMD and Intel CPU pricing information compared with initial release pricing.

CPU	Released	Original Price	Current Price	Last Month's Price
AMD Athlon XP 1600+	10/09/2001	\$160	\$60	\$61
AMD Athlon XP 1700+	10/09/2001	\$191	\$71	\$71
AMD Athlon XP 1800+	10/09/2001	\$252	\$78	\$80
AMD Athlon XP 1900+	11/05/2001	\$269	\$89	\$102
AMD Athlon XP 2000+	01/07/2002	\$339	\$99	\$121
AMD Athlon XP 2100+	03/13/2002	\$420	\$122	\$148
AMD Athlon XP 2200+, 0.13 micron	06/10/2002	\$241	\$168	\$203
AMD Athlon XP 2400+	08/21/2001	\$193**	\$183**	N/A
AMD Athlon XP 2600+	08/21/2002	\$297**	\$297**	N/A
Intel Pentium 4 1.5 GHz	11/20/2000	\$819	\$111	\$112
Intel Pentium 4 1.6 GHz	04/23/2001	\$294	\$117	\$127.50
Intel Pentium 4 1.7 GHz	04/23/2001	\$332	\$125	\$135
Intel Pentium 4 1.8 GHz	07/02/2001	\$562	\$145	\$120
Intel Pentium 4 1.9 GHz	08/27/2001	\$175	\$164	\$165
Intel Pentium 4 2 GHz	08/27/2001	\$562	\$168	\$179
Intel Pentium 4 2.2 GHz	01/07/2002	\$542	\$189	\$241
Intel Pentium 4 2.4 GHz, 400MHz FSB	04/02/2002	\$562	\$196	\$348*
Intel Pentium 4 2.5 GHz, 400MHz FSB	08/26/2002	\$243**	\$243**	N/A
Intel Pentium 4 2.6 GHz, 400MHz FSB	08/26/2002	\$401**	\$401**	N/A
Intel Pentium 4 2.26 GHz, 533MHz FSB	05/06/2002	\$423	\$198	\$139*
Intel Pentium 4 2.4 GHz, 533MHz FSB	05/06/2002	\$562	\$198	\$360*
Intel Pentium 4 2.53 GHz, 533MHz FSB	05/06/2002	\$617	\$242	\$301*
Intel Pentium 4 2.66 GHz, 533MHz FSB	08/26/2002	\$401**	\$401**	N/A
Intel Pentium 4 2.8 GHz, 533MHz FSB	08/26/2002	\$288**	\$508**	N/A

*Retail price.

**Manufacturer price per 1,000 units.

Other current prices, if indicated, are lowest OEM prices available through Pricegrabber.com.

In Software . . .

Mr. Chairman, I Yield The Floor To The Penguin

It's a common question: How far should governmental institutions go to save money for their tax-paying constituents? One San Diego resident thinks California's state governmental institutions can go a lot further when it comes to OS software.

Lawyer Walt Pennington, a member of the San Diego Linux Users Group, recently proposed that the state only purchase open-source software, thereby potentially saving multiple millions of dollars. Pennington has created the DSSA (Digital Software Security Act) to further his idea. Pennington says open-source software's licensing conditions are less restrictive, giving the state more freedom to change source codes to meet its needs and use the software without restrictions.

The DSSA is receiving support from several areas of the computer industry, including from RedHat, a Linux OS company. ▲



If a San Diego lawyer has his way, state government offices in California will switch to open-source software products, such as this Linux OS from RedHat.

WinXP

Update Skewers Pirates

Microsoft is taking a proactive approach when it comes to battling software pirates. Those who've used pirated product keys to install and use WinXP will be denied access to updates for the software, including WinXP Service Pack 1. When a user attempts to download an update to WinXP after Oct. 2, Microsoft will check the WinXP product ID, looking for commonly pirated ID numbers. In addition, if a user tries installing SP1 into a patched version of WinXP, Microsoft could bomb the OS. ▲



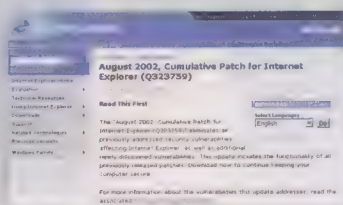
Illegal installations of WinXP could bomb when users install SP1.

Software Shorts

Here are a few software tidbits we found just before press time.

Another Day, Another Microsoft Patch

Announcements of software patches to plug security holes in Microsoft products never seem to end. The software giant announced new patches for Internet Explorer and Office Web Components in late August. The six vulnerabilities in IE affect versions 5.x and 6.0 and could let a hacker take control of your system. A single patch will fix all six vulnerabilities, and it's available at www.microsoft.com/windows/ie/downloads/critical/q323759ie/default.asp. A hacker also could use a vulnerability in Office Web Components, which is built into products such as Microsoft Money and Office XP, to gain control of your computer. Visit <http://www.microsoft.com/technet/treeview/default.asp?url=/technet/security/bulletin/MS02-044.asp> for more information on the available patches. ▲



New Mac OS Pounces On Sales Record

Apple's Jaguar has pounced. Jaguar, the code name for Mac OS X version 10.2, set a sales record for the company of more than 100,000 units sold in the first weekend after its late August release. No other Mac OS has sold as many units as quickly as Jaguar has. Jaguar (\$129) offers 150 features you couldn't get in Mac OS X version 10, including iChat instant messaging, junk mail filtering, handwriting recognition, and Apple's new networking technology, called Rendezvous. Apple promoted the new OS release with a "midnight sale" at 35 Apple retail stores throughout the United States, which, along with several favorable reviews, significantly boosted sales. ▲



New Life For WordPerfect

Microsoft Office dominates the office software suite market, but Corel's WordPerfect office suite has found a niche here and there. Corel's latest success involves a deal with Hewlett-Packard in which HP Pavilion computers began shipping in September with WordPerfect 10 and Quattro Pro 10 preinstalled. In a similar deal with Dell, Corel's products will ship with Dimension and Inspiron computers. In both agreements, the Corel products will replace Microsoft Works software previously preinstalled on the machines. ▲

Internet . . .

Console Wars Move To 'Net

The realm of Internet gaming is prepared to travel in a new direction, and it won't be anything like playing Hearts with "johndoe72311" on AOL. Those who should know gaming best—the console makers—are rolling out hardware and services that let users connect their consoles to the Internet, providing for multiplayer gaming from far-flung locations.

Sony, the manufacturer of the PlayStation 2 console, began selling Internet adapters (\$40) for PS2 units in late August. The adapters will work with dial-up or broadband Internet connections. Sony will let game publishers determine whether they'll charge a fee for online gaming through the PS2. Users will connect through their ISPs.

After a successful test of its Xbox Live system in late August, Xbox manufacturer Microsoft is on track for launching Xbox Live Nov. 15. Xbox Live will be a broadband-only subscription-based service Microsoft will run, with games residing on servers Microsoft will host. The Xbox Live service, which also will include headphones featuring the ability to use real-time speech, should cost about \$50 annually.

Although the initial level of excitement for these services has been high, at least from gaming enthusiasts, gaming analysts and gaming companies don't expect Internet gaming to draw large numbers of customers until at least 2005. Sony, for example, is hoping to sell 400,000 Internet adapters before the end of 2002, which would serve slightly more than 1% of the 33 million PS2 units it has sold worldwide in the past two years. ▲

New Servers Fight Back Against Hackers

Hackers love a challenge, and two former Motorola engineers may have one in store for them. Eric Hauk and Eric Uner formed a consulting firm in 1995 called Virtual Media in Barrington, Ill. After a name change to Bodacion Technologies, the company introduced Web servers that it claims are hacker-proof. The servers, named HYDRA, run without an OS, making them almost immune to crashes. Obviously, HYDRA servers won't offer many frills or special features, but they do offer strong reliability. The servers use a kernel of code consisting of about 4KB, giving hackers little to exploit. Hauk and Uner have a background in embedded systems design, and they've applied embedded systems principles in HYDRA servers.

Of course, claiming to have a hacker-proof server is as good as inviting hackers to try to hack the servers, experts say. However, government officials from several agencies are testing the servers, according to Bodacion. The company hopes federal agencies will begin placing HYDRA servers in use by the end of 2002. ▲

DSL Broadband Prices Leveling Off

After more than one year of price increases, a recent survey indicates residential broadband customers—especially DSL customers—began enjoying steadying prices for service in mid-2002. An ARS survey showed DSL monthly Internet service in the United States averaged \$51.36 in June 2002, an increase of 0.5% over the average at the end of 2001. In 2001, DSL monthly service costs

increased 9.8% from January through December. The average DSL monthly cost actually fell 46 cents from March 2002 to June 2002.

Average Broadband Monthly Prices

	Cable	DSL
December 2001	\$43.21	\$51.09
March 2002	\$44.95	\$51.82
June 2002	\$45.31	\$51.36

Source: ARS

Cable Internet service customers also have seen a slight steady-ing of prices lately, although nowhere near the degree of DSL customers. Monthly cable Internet service in the United States cost an average of \$45.31 in June 2002, a rise of 4.8% in the six-month period from the end of 2001. In 2001, cable Internet service costs rose about 9.7% in the 12-month period from January through December. However, in the three-month period from March 2002 through June 2002, the average cable Internet bill increased only 36 cents (0.8%).

ARS says about 62% of broadband customers currently are cable Internet subscribers. ARS analysts say they expect broadband Internet usage to grow among consumers in the coming months as ISPs begin offering tiered services with varying price points. ▲

Web Link Lawsuit Hits Tangle

Many things make the Web a popular entity, but hyperlinks are one of the best. Ah, wouldn't it be great to own the patent on that technology, collecting a fee each time someone clicks a link? BT Group, a large telecommunications company based in the United Kingdom, was hoping to do exactly that, filing a lawsuit in White Plains, N.Y., that claimed its 1976 patent applied to the hyperlink system commonly used on the Web today. However, U.S. District Judge Colleen

McMahon recently threw out the lawsuit BT Group had filed against the ISP Prodigy. BT Group had hoped to use the suit against Prodigy as a test case.

BT Group's patent mentioned technology consisting of blocks of information stored on a central computer. However, McMahon rejected the argument, saying the purpose of the Internet is to decentralize information, and the Internet has no central computer.



'Net Destinations

Looking for some new surfing destinations? Here's a sampler of some sites we thought you might enjoy.

"Where's The Any Key?"

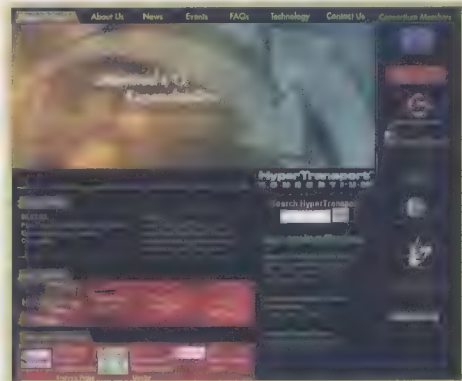
Most of you have heard the technical support story featuring the "Where's the any key?" question. Whether the story is true or an urban legend is debatable, but one thing's for sure: It's funny. If you're looking for more laughs from clueless computer user stories, try the Computer Stupidities Web site (www.rinkworks.com/stupid). The site will keep you laughing, and you'll definitely feel reassured about your level of computer knowledge after reading some of the questions users allegedly have asked their tech support person.

The Quick Brown Fox

How much more efficient would you be when working at the computer if you only could type more quickly and more accurately? The Typing-Master Web site can give you an idea with its typing test (www.typingtest.com/index.asp?go=typetest). The site measures your speed and accuracy. It then offers to help you improve your results with its fee-based software products. The basic typing test, however, is free.

Excited About HyperTransport

Keeping track of new technology can be a difficult endeavor, but the HyperTransport Technology Consortium has simplified things. The consortium recently reworked its Web site (www.hypertransport.org) to help users better navigate the site and find useful information about HyperTransport technology. Try visiting the Featured Product Section of the site to see products available that make use of HyperTransport. The site also contains information about members of the consortium and upcoming events and conferences for HyperTransport. (See "HyperTransport Technology" on page 42 of this issue for more information on the technology.)



The HyperTransport Web site recently received a facelift. Now users can find new information about the technology at the site.

BIOS Upgrades Available Online

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new outlook on life. Here are a few recently released upgrades. Check out www.smartcomputing.com/cpumag/nov02/bios to see the entire upgrade list.

Manufacturer	File (Date Available)	URL
MSI (Micro-Star International)	6545v20.exe version 2.0 (8/15/2002)	www.msi.com.tw/program/support/bios/bos/spt_bos_detail.php?UID=345&NAME=MS-6545%20Ver2.0
MSI (Micro-Star International)	6398e54.exe version 5.4 (8/11/2002)	www.msi.com.tw/program/support/bios/bos/spt_bos_detail.php?UID=311&NAME=MS-6398E
MSI (Micro-Star International)	6566v54.exe version 5.4 (8/11/2002)	www.msi.com.tw/program/support/bios/bos/spt_bos_detail.php?UID=313&NAME=MS-6566E
MSI (Micro-Star International)	6566v13.exe version 1.3 (8/15/2002)	www.msi.com.tw/program/support/bios/bos/spt_bos_detail.php?UID=358&NAME=MS-6566
MSI (Micro-Star International)	6567v11.exe version 1.1 (8/25/2002)	www.msi.com.tw/program/support/bios/bos/spt_bos_detail.php?UID=79&NAME=MS-6567
MSI (Micro-Star International)	6547v50.exe version 5.0 (8/4/2002)	www.msi.com.tw/program/support/bios/bos/spt_bos_detail.php?UID=352&NAME=MS-6547%20

You Get PAID For That?

Living Billboard Acclaim UK

The value of human identity seems to have plummeted. Acclaim UK is looking for five living billboards, people who are willing to change their names to promote its first-person action title, *Turok: Evolution*. (See our review on page 92.) It is called "human branding," turning everyday people into "walking, talking, living, breathing advertisements" for a product, says Acclaim. The salary for this gig? Less than \$800US.

The marketers behind all of this presume that anyone who introduces himself or herself as *Turok* certainly will have to explain the name, its roots, and the product associated with them to new acquaintances. This gets the word out about the new game in a unique way.

But it seems to have escaped these marketers that such a scenario also raises questions about the mental balance of anyone who would change his name to a game character for a mere \$800. No word yet on whether these five *Turoks* will have to dress and talk like the prehistoric Native American who headlines the game. Add a grunt, a spear, and a loincloth to anyone introducing himself to you as *Turok*, and we envision the crowds in Piccadilly Circus scattering fast. ★

RAW DATA



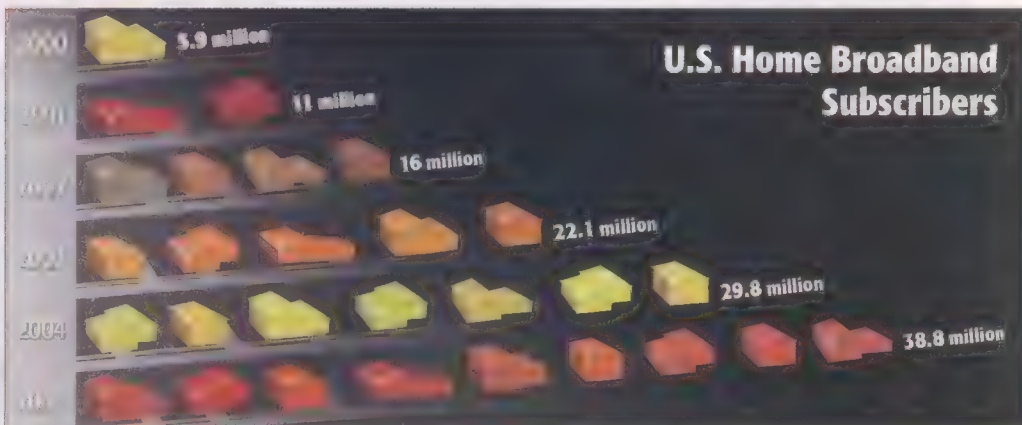
Broadband's Coming . . . Any Day Now

High-speed Web access continues to penetrate the U.S. home market, one suburban block at a time. Most industry analysts admit that broadband acceptance has been slower than they had expected in the late '90s, when most of them predicted

all of us would be driving the Internet at 300Kbps speeds or faster by now.

According to Parks Associates, broadband acceptance will be more of a long, slow march than a blitzkrieg. The 16 million high-speed access subscribers in 2002 will

increase only to 22.1 million in 2003, not exactly the usual breakneck pace for revolutionary media technologies. Don't expect a real critical mass of high-speed households until about 2005, when penetration should (well, might) approach 39 million.



Confined To Coach



Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chromeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is President and CEO of WildTangent Inc., a technology company devoted to delivering CD-ROM quality entertainment content over the Web.

If my cell phone is so dangerous to leave on, why do they even let me bring it on the flight? Wouldn't there be dozens of al-Qaeda members flying around on our airlines with cell phones secretly left on? Anyway, I'm cranky because I got stuck in coach and if I had any hope of using my laptop in such cramped quarters, it was crushed by the fat lady in front of me who just reclined her seat. I can almost work if I do the same to the yuppie behind me trying to use his laptop. It's times like this when I can clearly imagine the ultimate wireless device.

Has anybody else noticed that a modern projector can get you a crystal clear 60-inch computer display on your wall for the same price as a 15-inch flat screen monitor? Why do I even need a monitor anymore? Why doesn't my computer just come with a 32-inch silk hanky I can hang on my wall and a mini projector? They work great. Come to think of it, wouldn't it be great if my cell phone included a miniature projector that could kick out an 18- to 32-inch image? Maybe a little cell phone docking station that doubled as a projector and included a TV-out port. It could come with a little Hobberman wire frame to suspend the projector above my airline tray and project down. My fantasy cell phone comes with a video camera that allows it to double as an optical mouse. The projector gives me a decent-sized screen to work with and the phone acts as the mouse and provides the computing power.

When I go to a meeting, I just plug my cell phone's video-out into a TV set in the conference room or aim the projector at a wall to show my PowerPoint slides. It would be nice to have one of those collapsible Palm Pilot keyboards for it, but even that seems a little cumbersome. I should be able to use some combination of the buttons on the phone when it's doubling as a mouse, and voice recognition to communicate with it.

As I mentioned, it's got a camera so I can use it to videoconference, copy documents, take pictures, and use it as a motion-detecting security device that can call for help if I set it up appropriately in my car, home, or hotel room. I also use it to scan my own groceries and charge myself when I go shopping. Naturally, as a precaution, it scans my thumbprint before letting me use it.

When I'm at a friend's house, I can turn it sideways and use it as a game pad. It's got a 2GHz CPU, 100GB of storage, and 802.11 networking, so it's got all my games, music, and favorite videos. It connects automatically to my friend's home network when I visit and we can death-match on our own separate projection screens. Hell, it's a cell phone; we can death-match from opposite sides of the world and hear each other's voices live, for that matter.

Of course, it's also a GPS, so not only can I find my way anywhere with the thing, but it even speaks the directions aloud while I'm driving, and if I have a friend I want to find who owns the same kind of phone, it can lead me directly to them (or to my

kids if I've misplaced them at a mall).

When I'm watching TV, it's my game console, game pad, remote control, and TiVo all in one. It's the stereo too if I plug it into an amp. When I want to use it on short notice as a PDA, I just use the mini screen it comes with and the game pad thumb controller or my voice to navigate.

Damn, my laptop battery is dying as I write this. I'd better add a hydrogen power supply to my phone design so it won't have this probl . . . ■

Reach me at TheSaint@cpumag.com.

Has anybody else noticed that a modern projector can get you a crystal clear 60-inch computer display on your wall for the same price as a 15-inch flat screen monitor? Why do I even need a monitor anymore?

EXTREME HARDWARE

These Gizmos Don't Sing It, They Bring It

You may be swept up in the autumn whirlwind of sports and activities by the time you read this, but at this writing, we're stuck in the horse latitudes of summer. Becalmed between the easterly breezes of TECHXNY and the westerly gales of COMDEX, we're keeping a weather eye out for cool new hardware to float by. Meanwhile, here's our catch of the day, along with a few other pieces of flotsam we didn't have time to examine earlier. Enjoy. (By the way, the "scrump-dilly-icious" taste of albatross has been greatly exaggerated.)

by Marty Sems

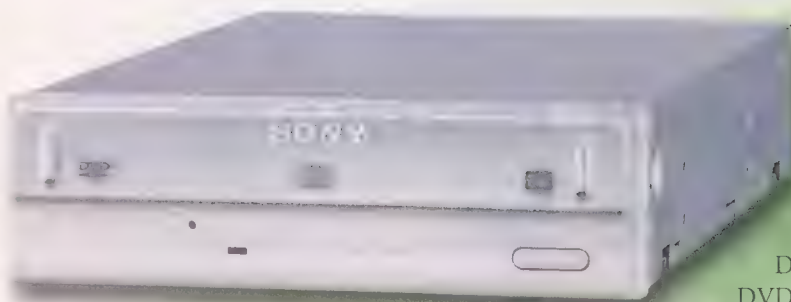
Raytek PhotoTemp MX6

Your doofus brother has once again left your PDA in his car, but at least this time you have proof that your handheld reached a damaging temperature. If a snapshot of your cooking PDA—complete with its temperature and the date and time—doesn't melt the seal on your brother's wallet, perhaps your camera's replicant-hunting demeanor and laser-aiming reticle projected on his forehead will. Raytek's PhotoTemp MX6 (\$1,495; www.raytek.com) is less a digital camera that takes temperatures from a foot away than it is an infrared thermometer that also takes pictures. It has an automatic flash and can take as many as 26 photos at 640 x 480 resolution (100 photos at 320 x 240). It also can log temps from 1,600 degrees Fahrenheit down to a chilly 25 below, or down to -58 degrees with optional hardware. The PhotoTemp MX6 is really geared toward industrial equipment inspection, but there's nothing to stop you from playing "who's a hottie?" at your next social function.



Mission Pilastro Loudspeakers

Mission: Impossible? Impossible for us to own without a major raise, yes. For slightly less cash than an Apollo mission cost, you can equip your pad with these rocket-sized Pilastro loudspeakers (\$35,000). Handcrafted in the United Kingdom by Mission Symphonix Limited (www.mission.co.uk) and distributed in the United States by Denon (www.usa.denon.com), these 5-foot pillars of sound can fill your control center with the most exquisite audio reproduction this side of the cosmic spheres. They reach a stunning 95dB sensitivity rating through 1.25-inch tweeters, 6.5-inch drivers, and 8-inch woofers, all employing exotic-sounding materials such as neodymium, Kapton, kryptonite, and dilithium crystals (well, some of those, anyway). There's much more to these angelic chorus members, but you'll prefer that we shut up and let them speak for themselves.



Sony DRU-500A

Can't we all just get along? Sometimes it takes a double agent playing both sides of the fence to get warlike factions to shake hands.

Sony took part in both the DVD Forum and the DVD+RW Alliance, as no one knew which rewriteable DVD format(s) would eventually dominate the market.

Sony's DRU-500A may just topple the wall between the two camps. If you or someone you love has been waiting to buy a rewriteable DVD drive until the DVD-RW vs. DVD+RW format wars shake out, consider that this drive may moot the argument by supporting both. It even supports their write-once counterparts, DVD-R and DVD+R, plus CD-RW. And forget those \$500 to \$600 price tags on its either/or forerunners. Sony's peacemaker arrived in September at about \$350 (www.storagebysony.com). Talk about a peace dividend.

Ellula HotAir Speakers

Here's something about as far from Mission's Pilastro speakers as you can get. Sure, Ellula's HotAir speakers may not sound as good, but you can't exactly deflate your precious Pilastros and take them to the beach with you, can you? Round out your collection of inflatable novelties with some Day-Glo HotAir Revos or relatively understated C-2s (\$49; www.ellula.com). Flat NXT speakers resonate with the HotAirs' inflated shells to give your MP3 player or radio a warm aural presence, using either batteries or the included AC adapter. The best part is that you could buy 700 pairs of HotAirs for the price of one set of Pilastros. We'd love to see the lawns at Graceland, Neverland, and whatever Sting calls his house covered in HotAir speakers, all chirping "We Are The World" and swaying in the breeze. Just please remember to tip us off before you do it.



GP32 Game Park Wireless RF Multiplayer Game System

It's all about wireless, baby. OK, so some of us are still wowed by LAN gaming, the Game Boy Advance's multiplayer cables, and the Xbox's broadband future. These make Korean and European gamers roll their eyes and fake a yawn, however.

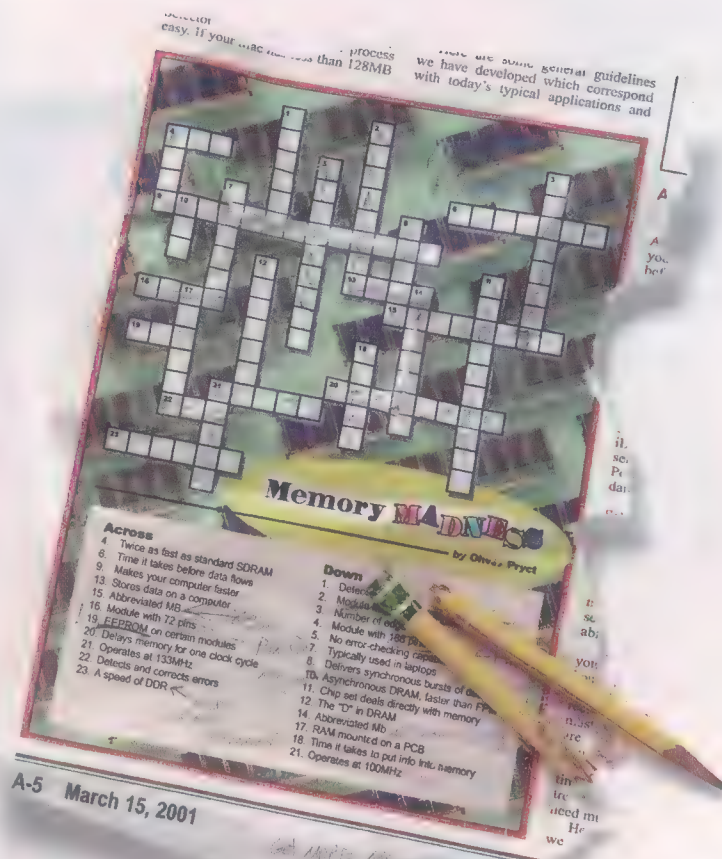
How about a 2.4GHz wireless game unit with no cables to break, lose, or trip over? Oh, yeah. We're talking about Game Park's GP32, which allows up to four-player head-to-head gaming per channel (about \$159; <http://english.gamepark.com>).

We're talking about Wolfenstein 3D and Doom (third-party ports, that is) in 320 x 240 resolution, 65K colors, and 16-bit stereo. We're talking about a gadget with a Smart Media slot, 8MB of internal SDRAM, and a USB cable that lets it double as external storage or an image viewer. Finally, a free SDK download and the efforts of diligent underground developers may make your search for a GP32 worthwhile, though it may prove tough to find in the States.



Upgrading your memory doesn't have to be complicated.

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for today's most popular systems

Price reflects an automatic 10% discount for ordering online. Prices may vary according to specific system requirements. The price listed was valid on 9/18/02 when we sent this ad to the publisher; however, prices may have dramatically increased or decreased since then. Visit the FAQ section of Crucial.com to learn more about why memory prices go up and down.

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Shuttle XPC SS51G Barebones PC



XPC SS51G Barebones PC

\$345

Shuttle Computer Group
(626) 820-9000
www.shuttlegroup.com



We've all heard the saying "good things come in small packages," right? But when applied to the PC arena, any mention of micro and/or ultra low-profile cases will likely send you in the other direction. Before you do head off, just ponder this: How much space do you really have on your desk, and just how heavy is that PC you lug over to your best pal's house every weekend for a LAN party? You may want to check out this little number from Shuttle Computer Group, after all.

Design. Apart from offering extremely overclocker-friendly motherboards, Shuttle is also forging ahead with compact Barebones case designs that are small, sleek, and quiet. About

half the size of a standard desktop, Shuttle's XPC range measures 7.24 inches high x 8 inches wide x 11.2 inches deep. The XPC achieves quiet thanks to an innovative approach to cooling that does not require a noisy 4200+ rpm CPU fan. Instead, liquid-filled vacuum tube heat pipes acting as heat conductors move heat away from the processor to a heat sink near the single case fan. In car tweak speak, think of it as direct-port NOS, if you will. Hence, the P4 processor of your choice stays relatively cool.

The case itself is designed to fit a custom-designed Flex ATX Shuttle FS51 motherboard with a SiS 651 north bridge and SiS 962L south bridge, which is able to run the faster 533MHz FSB Pentium 4s. The mainboard also supports aggressive memory timings with two DDR333 184-pin DIMM slots supporting as much as 2GB of DDR SDRAM and two ATA/133 channels, so performance is more than up to scratch. It won't match an i850E with RIMM4200 but is still ample for all your LAN-party gaming needs. Plop in a 2.8 or 2.53GHz, and you've got a screamer.

Specifications. In a PC with such minute dimensions, Shuttle has in the past limited your choices by forcing you to use onboard graphics. This is fine and dandy if your intended use is for Web browsing and email,

but gamers need an AGP slot for their RADEON 9700 or GF4 Ti 4600 boards. The XPC now offers a single AGP slot and a PCI slot to boot. Onboard sound is provided via an onboard RealTek ALC 650 that supports AC '97 v2.2 (5.1 channel). As mentioned, onboard graphics support is also present with an integrated SiS651 VGA, but there's an AGP slot for a reason, so use it.

As a Barebones system, what you get is a case, power supply, and custom-fit shuttle mainboard. Don't try finding your own because there isn't one that fits. You'll need to add in your own hard drive (it's got room for two), media drive, CPU, memory, and graphics card. Space is tight, making installation a little more hairy than usual, but you can't have it all. . . . Follow the simple instructions and don't obstruct airflow or attempt to overclock like mad, and you should have a rather reliable, zippy, and quiet PC. Band-Aids are not required: Installation is cut-free, thanks to a total lack of sharp edges. The thumbscrews are a nice thought, also.

The outside of the case offers ports aplenty with two FireWire, one SPDIF -plus 5.1 digital sound connectors, two USB2.0, two serial ports, and a single 10/100 Ethernet port (integrated RealTek RTL8139). It looks tasty decked out in metallic silver with an opaque bluish plastic front bezel that scores high with style points.

Also included in the package is an 80mm Sunon fan, a heatsink with heatpipes, a single Rounded ATA133 Cable (a standard one is also included), one floppy cable, a power cable, a bag of screws, and zip ties. When fully armed, the whole PC weighs 13 pounds, which is roughly three more than a heavy-weight notebook but with much beefier specifications and performance capabilities. Installation CDs and a manual are also included. So, for \$369, you get a fancy-pants minisystem that will get you stares and glares from the opposite sex. Not really, but the XPC range will only get stronger with the imminent introduction of an nForce2-based Athlon XPC. . . . ▲

XPC SS51G Benchmarks	
3DMark2001 Default	11307
Quake 3	255
Commanche 4 Default	48
Serious Sam TSE	102
Tested on a WinXP Pro with a P4 2.53GHz	

by Alex "Sharky" Ross

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

AMD Athlon XP 2600+ vs. Intel Pentium 4 2.8GHz

At the rate Intel and AMD are releasing faster CPUs, it's hard to believe the industry is undergoing the mother of all downturns. But here we are, just another month down the road, and the boys in blue (Intel) and the folks in green (AMD) are hard at it yet again, vying for performance supremacy. Meanwhile, AMD and Intel are undergoing poor earning reports and layoffs aplenty, but CPUs keep getting faster, smaller, and even cheaper. Gee, could be worse. . . .

On tap for this month is the Pentium 4 2.8GHz vs. the Athlon XP 2600+. The P4 has been upped from 2.53GHz with very little technological fuss on Intel's part. (It's not uncommon for P4 owners to be running in excess of 3GHz overclocked.) The Northwood has, in fact, been tweaked just a tad by Intel, allowing for a 1% to 2% performance gain. Larger power delivery capacitors also live on the underside of the newer core. The 2.8GHz is just like Scottie, who always needs more power. A higher 1.525 core voltage is now required, up from 1.5 volts previously. Overclockers use this method all the time when upping the frequency of chips, and obviously Intel can play the game, too. Other than a simple BIOS update, current socket 478 mainboard owners needn't worry too much; the new CPU will work fine and dandy.

AMD's offering might not be based upon the "eagerly awaited" Barton core but is still a slightly more impressive achievement, at least from a technological standpoint, especially when considering the rather lukewarm reception the new Thoroughbred core met upon release. Overclockers had little luck in going beyond the 2200+'s 1.8GHz frequency, and so rumors spread about the end looming near. Instead, AMD has responded by upping its new fastest CPUs to 2.0GHz and 2.13GHz, which, considering the company's previous habit of upping frequency by 66MHz increments, is an extremely aggressive leap. When run through AMD's slightly "revamped" marketing nomenclature, you will see these processors go under the name of the Athlon XP 2400+ and 2600+, respectively.

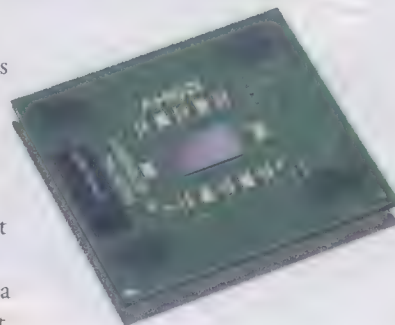
Further engineering and tweaking of the existing core was necessary to "turn up the juice," as AMD puts it, and hence going upward from the 2400+, a revised Thoroughbred core will be used for the Athlon XP range. An additional metal

layer was added (totaling nine), reducing resistance and capacitance. The transistor count was upped from 37.2 to 37.6 million and additional decoupling capacitors have been engineered, reducing electromagnetic interference. The end result is a slightly larger core die size (which will add to the production costs) now at 84mm² up from 80mm². Unfortunately, the only way to tell which core you are getting is via the WCPUID program, which is obviously not something you can just whip out while waiting in line at your nearest and favorite PC component retailer. Backward compatibility isn't a problem, however, and socket 378 users only need to install a BIOS update.

With an earlier-than-planned 2.8GHz release, Intel is painting a pretty clear picture of its intentions to go beyond the 3GHz barrier before the year is out. This release also shows just how scaleable and long lasting the Northwood core is proving to be. AMD's 2600+ release sees the company crack that magical 2GHz (and with more efficient IPC), which some analysts doubted was possible with the original Thoroughbred core. It also instills confidence in the company's 0.13-micron manufacturing capabilities once more. All in all, AMD may not have taken the performance crown back from Intel, but it has certainly proved it can close the gap.

The introduction of these speedsters has caused both camps to aggressively slash older CPUs' prices in an "end of summer sale" fashion. The P4 2.8GHz is available for \$508, and the Athlon XP 2600+ comes in at \$297. (The 2400+ is \$193.) Bargains are to be had on both sides now, so do your homework on www.price-watch.com, but unless you absolutely need to have the fastest available processor for either platform, my advice is to sit tight and wait a couple of months to see how AMD's Barton and Intel's "next" P4 changes the playing field. ▲

by Alex "Sharky" Ross



Athlon XP 2600+

\$297
AMD
(800) 538-8450
(408) 732-2400
www.amd.com



Intel & AMD Meet Again		
	Athlon XP 2600+	P4 2.8GHz
3DMark 2001 Default	11795	12823
PCMark 2002 CPU Test	6289	6890
Internet CC SYSmark2002	301	367
Office Productivity SYSmark2002	179	200
Quake III	286	351
Comanche 4 default	50	57
Serious Sam TSE	112	111



Pentium 4 2.8GHz

\$508
Intel
(800) 628-8686
(408) 765-8080
www.intel.com



CPU
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First Look: Preview

ATI Mobility Radeon 9000



Mobility Radeon 9000

No Price Available

ATI

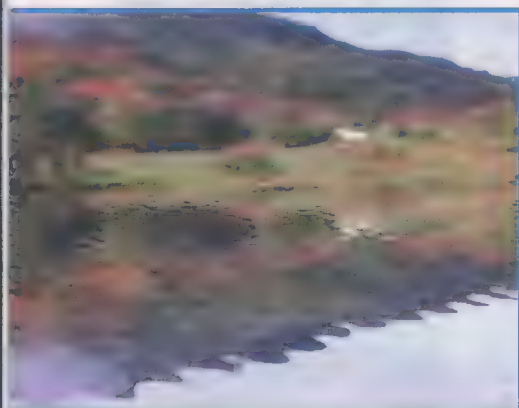
(905) 882-2600

www.ati.com

Preview: No Rating

"The M9 part is the first part we have that can actually do all of the high-end features necessary for optimal performance of DOOM [III]."

— DOOM creator and id Software co-founder John Carmack



According to industry stats, more than 100 million Americans play computer games, and the gaming market now outstrips movie ticket sales. The problem is that the best games have all been bound to desktops. The best mobile graphics chips have been NVIDIA's GeForce4 Go, which uses the same core as the GeForce4 MX, and ATI's Mobility Radeon 7500, which performs on par with the similarly named desktop card. But without DX 8.1 support, hardware-based vertex and pixel shaders, and other high-end graphics features, notebooks could only offer shoddy shading and texturing accompanied by abysmal frame rates. But when ATI announced its Mobility Radeon 9000 (aka the M9) in late August, the graphics performance gap between desktops and notebooks officially vanished.

Serious graphics. You've probably read about the Radeon 9000-generation desktop products. (See page 21 of the September *CPU*.) ATI has poured much of the same technology into this mobile format, plus several more surprise extras to sweeten the pot. For starters, the M9 remains the only mobile chip with a 64MB integrated frame buffer and support for DirectX 8.1 in hardware. NVIDIA is still working with DX 8.0, which means users get vertex shaders (lighting and texture effects applied to triangle vertices) but not the more granular pixel shaders. On-screen, pixel shaders make the difference between near-photographic realism and a bunch of nothing.

For example, a golf course water trap designed for pixel shaders is painted three times. First, a grayish tone is applied, then comes a reflective layer that reflects whatever light sources happens to be around it, such as a green tree. The third pass applies bump mapping so that the displayed image looks bumpy like water. Without pixel shaders, the water only looks like a flat field of gray. The shaders used in the M9 are version 1.4, which enables a higher level of programmability and realism than even the 1.3 shaders the GeForce4 Ti series uses.

Furthermore, the M9 can apply as many as six textures in a single rendering pass.

M9's other graphics features similarly echo the latest desktop card features. The shader engine also powers FullStream, a technology ATI developed with RealNetworks to apply anti-aliasing to real-time streaming video. ATI's anisotropic filtering/anti-aliasing technology, SmoothVision, uses as many as eight samples and 16 programmable sample modes per pixel to deliver remarkably jag-free visuals. ATI also applies an RMX (Ratiometric Expansion) Filter that makes text in non-native screen resolutions appear sharper.

With 36 million transistors, the M9 handily kicks out 40 to 45 million triangles per second on average. When we watched M9-equipped notebooks in action, gaming performance was smooth and convincing, and only high-detail tests like those in 3DMark could yield strained frame rates.

Beyond gaming. But the M9 didn't forget "productivity" people. ATI's multiple monitor management software, HydraVision, lets you instruct Windows how to display certain events. Whereas Windows might normally pop up a warning box so that it splits between screens one and two, you can tell HydraVision to always pick one screen or the other.

The M9 handles MPEG-2 decoding in hardware and can scale playback for two simultaneous displays. The M9 also supports digital flat panels and integrates TV-Out circuitry rather than the usual approach of requiring a discrete TV chip.

ATI has also passed the competition in power management. PowerPlay 3.0 is ATI's third take on juggling power consumption and performance, and the user-controlled options have never been more comprehensive. The technology is predominantly event-driven so that clock and voltage settings shift not only when the power cable is disconnected but also when different levels of activity occur within the CPU. Depending on battery size, you can expect PowerPlay 3.0 to enable anywhere from 10 to 45 minutes of extra runtime simply by manipulating the graphics core. ▲

by William Van Winkle

For more on the M9 launch party, see www.smartcomputing.com/cpumag/nov02/m9

DDR400

Just when you thought DDR333 (PC2700) was tip-top, memory makers are releasing DDR400 (PC3200) DRAM. At an effective frequency of 200MHz, this is a rather big jump from DDR333's 166MHz. The maximum theoretical bandwidth offered also shoots up from 2.7GBps with PC2700 to 3.2GBps for PC3200.

The issue here is to challenge Rambus RDRAM on the P4 platform. Chipset support is currently very thin, however, with VIA and SiS offering "unofficial" support for DDR400. Intel has no plans to support DDR400 with any of its chipsets and will finish the year with DDR333 support on its new i845GE and i845PE P4 (with Hyper-Threading) chipsets instead. On the Athlon XP side, SiS recently announced that it is dropping DDR400 support. Last year, JEDEC approved the preliminary spec for DDR-II for late 2003, which disappointed some who had expected

an earlier introduction. JEDEC also stated that DDR400 would not be part of DDR-II. Memory manufacturers such as Samsung decided they would produce DDR400 anyway.

Mushkin, one of the first to make a splash with DDR400, provided us with a PC3200 DDR stick. Because DDR400 is unofficial, Mushkin claims its PC3200 stick is a performance guarantee, and the company has run through a speed bin sort to make sure each stick works at 200MHz. The modules use 5ns-rated DDR components on a six-layer PCB in a single bank configuration. Cooling happens via purple integrated heat spreaders and distribution of components over both sides of the PCB. The 256MB stick will cost \$119.

In a joint press release with SOYO, the two companies have rallied around DDR400 with the P4X400 Dragon Ultra board. What

everyone is waiting for is DDR-II, which will improve P4 performance with chipsets such as "Springdale" next year. Nevertheless, it's fun to play with and not especially expensive either, even if it's "unofficial" still. Stick to DDR333; the majority of P4 and Athlon XP chipsets officially support it. As for DDR400, serious tweekers and over-clockers need only apply. To sum up this and other recent developments in the memory world, a line from "Top Gun" springs to mind: "Your ego is writing checks your body can't cash. . . ." ▲

by Alex "Sharky" Ross

- **DDR400**
- No Price Available
- Manufacturers Vary
- Preview: No Rating

New Intel Chipsets On The Way

This year's Intel Developer's Forum (IDF) turned out to be all about HyperThreading and Banias, but somewhere in the midst of the pizzazz, a shorter-term and slightly less exciting development oozed off the show floor. Intel is apparently planning to release a new flotilla of chipsets for the high-end, mainstream, and lower-end markets. Think of these platforms more as an "extension" of Intel's current lineup for its P4.

Here's what I managed to pick up. . . . The Intel 845PE has undergone and passed the company's strict validation process and hence, Intel will "officially" offer DDR333 support for the first time. Discrete AGP graphics and faster memory should prop up performance and challenge SiS' offerings more aggressively than before. The i845GE will also offer DDR333 memory support and AGP upgradability but carry an "enhanced" Intel Extreme Graphics label. The original i845G sported a 200MHz graphics clock core, which for the i845GE will be bumped up to a more competitive 266MHz. Gamers will nonetheless opt for the AGP port and discrete graphics. The

845GV chipset will be targeted at the low end but will at least offer support for 533MHz system bus processors. The graphics clock will be stock at 200MHz. Thus the days of 400MHz FSB P4s are obviously numbered.

With "Springdale" dual-channel DDR support due out by the middle of next year (by earliest estimations), this certainly prolongs the lifespan of the i850E RDRAM-based platform at the very top end. For Q4, Intel will update its i850E chipset to support PC1066 dual-channel RDRAM. Apparently screening has been improved, and thanks to better testing, the i850E will now be validated for more than just PC800.

In case you plan on getting a newer P4 with HyperThreading technology, all the aforementioned chipsets DO, of course, provide platform support. They will be released prior to P4s with HT when we will hopefully manage to grease our paws with review units. So watch this space; perhaps by next month, we'll have some performance numbers for you to chew on. ▲

by Alex "Sharky" Ross



New Intel Chipsets

No Prices Available
Intel
(408) 765-8080
(916) 377-7000
Preview: No Rating

.....

ViewSonic airpanel 100



airpanel 100

\$1,195

ViewSonic

(800) 888-8583

(909) 444-8888

www.viewsonic.com



New features can change the way you look at a device. The body of ViewSonic's airpanel 100 is almost identical to its PDA predecessor, the ViewPad 100, but the airpanel has an internal feature that transforms it from a bulky PDA into a sleek wireless monitor: It can port your computer's desktop. From the airpanel, you have access to everything on your computer, including files, apps, and Internet access (assuming your computer is connected). As a wireless monitor, the airpanel is the perfect size.

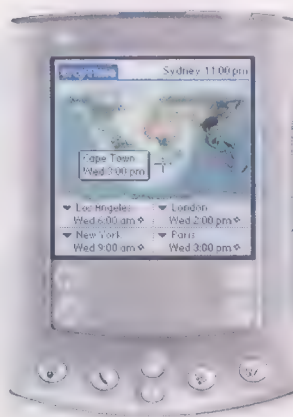
Like smaller PDAs, the airpanel is mostly screen. The 10-inch SVGA TFT LCD display swallows the squat, 8.0 inches high x 13.81 inches wide x 0.5 inches deep shell. A USB port, a mini-VGA port, and a Type II PC Card slot line the left side of the device. The top houses a Type II CompactFlash card slot. ViewSonic ships the airpanel without a built-in wireless card, so you'll need a wireless PC Card or CompactFlash card to connect to your computer. I

recommend a CompactFlash card; both cards extend from the slots, and the airpanel is a little unwieldy with a PC Card sticking out of its side.

The last item you will need to connect the airpanel to your network or computer is an access point or an adapter for your computer. If you use Windows CE .NET (airpanel's default OS) and you are connected to the Internet through an access point, you can surf the Web with Internet Explorer 5.5. The airpanel also includes Microsoft's Instant Messenger and WordPad. If you connect to your computer, the computer's Desktop will appear over the CE .NET OS. You can instantly toggle between the two Desktops.

ViewSonic plans to use Microsoft's Mira technology (a CE .NET-based technology that enhances the capabilities of wireless displays) in the airpanel's next version, the airpanel 150. ViewSonic is designing the airpanel 150 specifically for home users. ▲

by Joshua Gulick



m515

\$399

Palm

(800) 881-7256

(847) 262-7256

www.palm.com



Palm m515

Palm is replacing the m505 with the m515. In fact, Palm no longer includes the m505 in its lineup of active PDAs. (Palm retires its older PDAs to the Handheld Hall Of Fame, which you can peruse at Palm.com if you'd like to reminisce.) Because most of the m505's physical features are present in the m515, your m505 accessories should be compatible with the m515. A better display, more internal memory, and a newer Palm OS distinguish the m515 from its predecessor.

The m515 is light and thin at 4.9 ounces and 4.5 inches tall x 3.1 inches wide x 0.5 inches deep. I could easily slip the m515 into my pocket, and it fit well in my hand, if not quite as comfortably as the bulbous m100 series PDAs. The four buttons that shortcut to PIM applications are concave, and the two directional buttons have dimples, which makes it easier for you to press them with the stylus.

You can adjust the contrast setting of the reflective, active matrix display when you are in different lighting conditions. As a result, you can clearly see the m515's display whether you are

inside or out. The 16-bit display supports 65,000 colors, but it is up to software makers to make use of this feature.

The 16MB of internal RAM (double that of the m505) give the m515 plenty of storage space that you can boost by inserting a SD card or MultiMedia Card. The 33MHz Dragonball processor is no longer the fastest processor around, but it is speedy nonetheless.

Palm upgraded from Palm OS 4.0 in the m505 to 4.1 in the m515. The improvements are minimal: a color Note Pad and the auto-lock feature, which lets you hide entries. The software package is more likely to get your attention. It includes applications for viewing photos and editing documents.

With the extra memory and a better display, the m515 is a good step up from the m505. You won't watch movies or listen to MP3s on the m515, but if you want a good display and a strong software package, the m515 is a good choice. ▲

by Joshua Gulick

Handspring Treo 90

Not everyone likes the handwriting recognition software that most PDAs use, but reasonably sized PDAs with keyboards are hard to find. Handspring answers with the Treo 90.

Handspring's newest PDA is feature-packed. A 33MHz processor powers the Palm OS. It also includes WordSmith, a word processor application that is compatible with Microsoft Word. With 16MB internal RAM and a SD (Secure Digital) slot, the Treo has plenty of room for documents, games, or other applications.

At 4.2 inches tall x 2.8 inches wide x 0.7 inches thick and weighing 4 ounces, it is one of the shortest and lightest PDAs in Handspring's lineup. The flip cover sports a large window that gives you a clear view of the palmtop's 12-bit STN (Super Twist Nematic) color display while shielding both the display and keyboard. I liked using the six unprotected buttons toward the bottom of the Treo to navigate through several applications (such as the Address Book and To-Do List) without ever lifting the flip cover.

Handspring directs you to type on the miniscule QWERTY keyboard with one hand, using your thumb to type. The only feature that will slow your thumb down is the Option key. It is underneath the A key, which means that it is one of the closest keys to your palm if you are right-handed. To reach the main menu, you must press the Option key and then the Menu button, which is on the far right side of the keyboard. That can be annoying if you access the main menu often.

Another keyboard feature addresses an issue that most PDA manufacturers seem to largely ignore: accents. The Treo lets you scroll through a list of possible accents for any letter with the tap of a key.

Despite the weird Option key, Handspring has put together a good keyboard-dominant PDA overall. If you want power and a keyboard, the Treo is the way to go. ▲

by Joshua Gulick



Treo 90

\$299

Handspring

(888) 565-9393

(650) 230-5000

www.handspring.com



Pocketop Wireless Link PDA Keyboard

Vancouver-based Pocketop has done well for itself, and for PDA users looking for a little detachment, by creating a flagship product that actually works well: the Wireless Link PDA Keyboard, correctly billed as "the world's first wireless portable PDA keyboard."

The keyboard comes carefully packaged and, like a good "Mission: Impossible" device, it's a bit of a challenge to put together but, once in place, works exactly as it should. I set it up with a Palm i705. I installed the desktop software (included on CD), performed a HotSync, and spent less than a minute getting the Palm ready to use the keyboard. The package includes a stand that lets your PDA rest at a roughly 45-degree angle, and a reflector that lets the infrared beam bounce between PDA and keyboard for wireless connectivity.

After installing a single AAA battery (included), I was ready to type. The stand makes use of the PDA's stylus holder for support, and the keyboard has a little well on the

right side for storing a stylus upright. The keyboard is smaller than the average PDA, and it's a lightweight at 4.2 ounces.

Of course, whenever you use a keyboard as compact as this one, typing is a rather scrunched experience. What's cool about Pocketop's keyboard, though, is that the top row of keys curves up toward the top, and the bottom row curves up toward the bottom. This makes for a slightly concave typing surface, which results in a surprisingly natural feel. The shaped keys provide you with a better idea of where your fingers are than do keys on a flatter board.

The Wireless Link keyboard is worthwhile even if you don't use it wirelessly. It's compatible with more PDAs than I can list here, so check out the Pocketop Web site for details. ▲

by Cal Clinchard



Wireless Link PDA Keyboard

\$99

Pocketop

(866) 276-2538

www.pocketop.net



Pentax DigiBino DB 100



DigiBino DB 100

\$392

Pentax

(800) 877-0155

(303) 799-8000

www.pentax.com



If you have had it with your digicam's puny 3X optical zoom range, can't stand the oozing rate at which it focuses, and become livid when you miss a spectacular shot that was just a little too far away, Pentax has your number. It's the DigiBino DB 100, a pair of 7X binoculars equipped with a CCD.

The DB 100 looks a bit like equipment from the "Empire Strikes Back," with its clunky plastic body, protruding eyepieces, and flip-up 1.6-inch TFD LCD monitor. As the DB 100's feature set is rather limited, only a few easy-to-use controls grace its body. Power works through AA batteries.

Image resolution maxes out at 1,024 x 768, significantly less than a megapixel, so don't expect to print stellar shots with this one. Performance times aren't a problem, as there's no flash to recharge and little image data (about 100KB) to save to the 16MB

internal flash memory, which, by the way, you can't expand.

You can focus from about 6.5 feet to infinity, and if you so choose, engage the digital zoom for a bit more reach. I wouldn't recommend digital zoom, however, considering the DB 100's barely adequate image quality. Most of the photos I took had a lot of readily apparent noise, and many, as you can predict, were pretty blurry in low-light scenes. Colors were generally accurate, however, and I didn't notice any aberrations or blooming.

Considering the DB 100's hefty price and low-quality images, I'd be hard-pressed to recommend this one. You'd be better off looking for a traditional digicam with a higher-than-average zoom rating. But if you need a semi-compact camera with plenty of zoom, this one might do the trick. ▲

by Nathan Chandler

Samsung Digimax 350SE



Digimax 350SE

\$549.99

Samsung

(800) 762-7746

(201) 902-0347

www.samsungcamerausa.com



The 3.2-megapixel Samsung Digimax 350SE's main attractions are its bundled carrying case and its Schneider-Kreuznach 3X f2.6 7mm to 21mm (34mm to 102mm equivalent on a 35mm camera) lens, which produced less barrel distortion than any other camera I've tested.

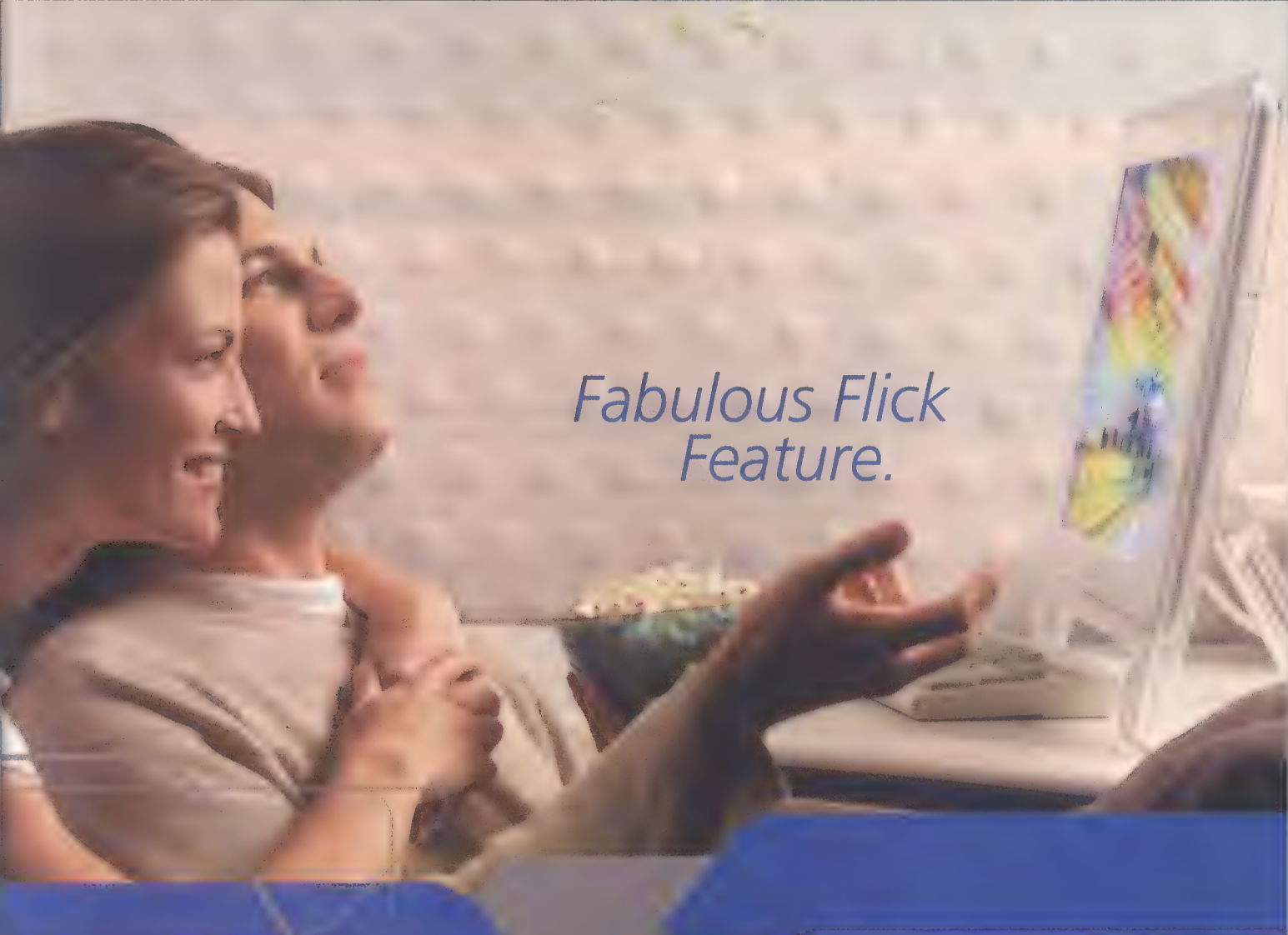
Images had some noise in dark areas, but the only other quality problem was some poor focusing, caused not by the camera's image capture or processing technologies but by its sound effects. How does sound affect image quality? A shutter sound effect plays after you press the shutter button, but the actual image capture occurs after the shutter sound. Instinct tells you it's OK to move after you hear the shutter sound, but if you do, your picture will blur. The best solution: Turn off the sound.

The 350SE's weakness isn't its photo quality; it's the camera's slow startup, focus, and

write speeds. It took six seconds for the power to come on and the lens to extend. Zoom was slow, it took a full second for the camera to focus (four seconds to move from wide to telephoto, with only 3X zoom), and it took about seven seconds for the 350SE to write to the memory card. During that time, I couldn't access the menus or change any other settings.

Samsung could have added a few features to make the 350SE more appealing. For instance, an AF-assist lamp might help with the slow focus times. Also, CF-II support would have been a welcome addition. What it comes down to is that I expect a little more from a camera that costs more than \$500. If you don't need to take quick shots (such as pictures of children, pets, or sports action), the 350SE does have good image quality. However, I'm hopeful that Samsung's next offering will address some of the 350SE's weaknesses. ▲

by Kylee Dickey




Fabulous Flick Feature.



CD-RW/DVD-ROM

**Plextor PlexCombo. The CD-RW workhorse
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All day Biff Braxton has put his PlexCombo™ through its paces. Writing. Rewriting. Speed-reading. Happy knowing he'll never have to worry about buffer underrun errors. Audio pops. Or jitters.

Biff has a Plextor®, part of the drive family that has captivated IT and audio professionals with award-winning performance. The PlexCombo 20/10/40-12A has been a workhorse for Biff. "A good thing, but all work and no play can make me and my trusty drive a dull duo," Biff banters. Suddenly, he remembers PlexCombo is also a quality DVD-ROM drive. Biff is thrilled. His root beer is chilled. In goes the DVD flick. And fade to black.

What drives you to Plextor? For work and play, the PlexCombo CD-RW/DVD-ROM is a blockbuster. Catch Plextor's latest attraction at www.plextor.com.



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48X/12X/48X CD-RW

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www.memorex.com



Memorex's new 48X/12X/48X CD-RW wasn't far behind the Lite-On 48X/12X/48X in reaching our testing labs. I expected very similar results from it, but what I got surprised me. More on that later, but in the meantime, I'm clearing out the No. 2 slot in my current list of top five favorite CD-RW drives and ordering a tasteful brass plaque labeled "Memorex 48X/12X/48X."

We prepped the Memorex in our test system, which has a 1GHz PIII, 384MB of PC100 SDRAM, and WinXP Pro. The drive was pretty fast, but it was nearly 30 seconds slower than the Lite-On in burning a full 700MB CD-R (3:23; 3:06 for a partial-disc burn of a 427MB folder). On the other hand, the Memorex burned CD-RWs faster than any other drive I've seen. It filled a CD-RW with a 639MB folder in 5:54 (4:35 for 427MB). That's more than two minutes faster than the Lite-On, for perspective. So, your choice between the two drives should

rest on which media you use more often: CD-R or CD-RW.

The Memorex wasn't as zippy as the Lite-On in reads and access times, averaging 4,586KBps reads and peaking at a one-time maximum of 6,658KBps in our five CD Tach test runs. The Memorex costs \$10 more than the Lite-On, but as I write this, Memorex is offering a \$30 rebate on its drive.

This drive comes with Ahead's Nero Burning ROM 5. It has a 1-year warranty and comes with a brief installation guide, ATA/33 and audio cables, and some mounting screws. Thankfully, Memorex kept most of its recent, ill-advised publicity shots of goofy-looking twentysomethings off the product box, although there's still an unfortunate haircut for the curious to find on the side panel. ▲

by Marty Sems

CenDyne Lightning IV CD-RW 48X/12X/48X



Lightning IV CD-RW 48X/12X/48X

\$149.99

CenDyne

(714) 556-1020

www.cendyne.com



CenDyne's 48X/12X/48X CD-RW doesn't pack too many surprises for me. It shouldn't, as behind its faceplate, it's the excellent

Lite-On LTR-48125W all over

again. As I've noticed with previous CenDyne brandings of Lite-On drives, there are minor performance differences even among identical models.

This CenDyne trailed the front-running Lite-On by about 20 seconds in full CD-R creation, yet pulled ahead by about a minute in full CD-RW writing. All of its scores help me place the CenDyne in the second slot in my list of five best CD-RWs, bumping recent arrival Memorex 48X/12X/48X down to an honorable third.

The 700MB CD-R burn I mentioned above took just 3:18 (minutes:seconds) with this CenDyne, while its 639MB write to CD-RW trailed the Memorex by more than a minute at 7:03. The CenDyne's partial burns of a

427MB folder took 2:50 for CD-R and 5:29 for CD-RW. It read an average of 4,983KBps (6,713KBps maximum) in CD Tach 2.52 on a 1GHz PIII system with 384MB of SDRAM and WinXP Pro. It settled on respective random and full-stroke access times of 81ms and 169ms, which are about average these days and mimic the Lite-On version of this drive.

Besides speed, this drive offers good support for formats outside the usual run of things. It supports the recent Mt. Rainier (CD-MRW) format, which could have some significance in the future for easier use of CD-RWs. The Lightning IV also supports Video-CD and SVCD discs, which are highly compressed CD alternatives to DVD. CenDyne's 30-page generic users manual could stand a few updates, but it is more comprehensive and illustrated than most I've seen. Add all this up, and you have a very nice package full of speed and extra features. ▲

by Marty Sems

CPU Ranking: \ 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

PNY Verto GeForce4 Ti 4200

There has been a flood of GeForce-based video cards debuting in the video card market over the past year or so as more and more companies try to hitch their wagon to the NVIDIA stallion. PNY is a good example. The company is primarily known for its memory products, but it makes good video cards, too.

The Verto GeForce4 Ti 4200 is one of the better Ti 4200 cards I've seen. It hits the sweet spot between price and performance. The Verto Ti 4200 I reviewed had 64MB of DDR SDRAM and a 350MHz RAMDAC. The card has the familiar maximum resolution of 2,034 x 1,536, with refresh rates from 60Hz to 240Hz. The Verto Ti 4200 is compatible with Win9x/NT4/Me/2000/XP.

The Verto Ti 4200 made an impressive showing in our benchmark tests. Its 3DMark2001 score of 8,948 is better than most Ti 4200 cards I've tested and not terribly far behind the Ti 4600 video cards I've reviewed. The Verto Ti

4200 also zipped through the Quake III test. Its frame rate at 800 x 600 was 238.7fps and 217.4fps at a resolution of 1,024 x 768. At 1,600 x 1,200, the card's frame rate dropped considerably but was still running at a fast and smooth 120.4fps.

The Verto Ti 4200 also displayed its power in the Serious Sam time demos we ran. In the Karnak demo, the card maintained a frame rate of 79.5fps, and in the Metropolis time demo, the frame rate was 86.4fps.

I'm a big fan of Ti 4200-based cards in general, and the performance of the Verto Ti 4200 further reinforces my belief that a Ti 4200-based card is the best choice for users willing to spend \$150 or more on a video card. The Verto Ti 4200 is nearly as powerful as a Ti 4600 card but only costs about \$200. That's great value. ▲

by Michael Sweet



Verto GeForce4 Ti 4200

\$199

PNY

(973) 515-9700

www.pny.com



VisionTek Xtasy GeForce4 Ti 4200

VisionTek is one of the most popular manufacturers of NVIDIA-based GeForce cards. The company has several video cards based on GeForce4 GPUs, including two Ti 4200 cards: a 64MB and a 128MB version. I checked out the 128MB version.

As the card's name implies, the Xtasy uses an NVIDIA GeForce4 Ti 4200 card and is equipped with 128MB of DDR SDRAM. Many Ti 4200 cards only have 64MB of memory, but the additional memory didn't give the Xtasy Ti 4200 a performance edge, as you'll see in our test results. The Xtasy Ti 4200 has a 350MHz RAMDAC and offers refresh rates from 60Hz to 240Hz, with a maximum resolution of 2,048 x 1,536. The card is compatible with the Win9x/NT4/Me/2000/XP OSes.

I thought the Xtasy Ti 4200 would do a little better in our tests than most Ti 4200 cards due to the extra memory, but our test results showed that the Xtasy Ti 4200's performance is average. The Xtasy Ti 4200's 3DMark2001 score of 8,743 is about average. The Quake III scores were slightly slow for a Ti 4200 card. The frame

rate at 800 x 600 was only 201.1fps. Yes, that's several times faster than you need for smooth gameplay, but most Ti 4200 cards that I've seen score a little higher than this. The frame rate at 1,024 x 768 was also average at 190fps, and the Xtasy Ti 4200's frame rate at 1,600 x 1,200 was only 113.4, which is a bit lower than most Ti 4200 cards I've reviewed lately.

As with the Quake III frame rates, the Xtasy Ti 4200's frame rates in Serious Sam were about average. The Xtasy Ti 4200's frame rate in the Karnak demo was 71.9, and I clocked the frame rate in the Metropolis demo at 78.9. Not bad, but not eye-popping, either.

The Xtasy Ti 4200 is a typical Ti 4200 video card. It offers good performance and costs considerably less than a Ti 4600. However, the 128MB version of the Xtasy Ti 4200 seems to cost a few dollars more than many Ti 4200 cards but doesn't offer significantly better performance. ▲

by Michael Sweet



Xtasy GeForce4 Ti 4200

\$229

VisionTek

(800) 726-9695

(847) 360-7500

www.visiontek.com



AOC 9KLR



9KLR

\$239

AOC

(800) 343-5777

(510) 770-1088

www.aocmonitor.com



AOC's 21-inch 9KLR CRT monitor comes in an ivory case that's as streamlined as possible for a value-line, large-screen model. Our lab techs hooked up the monitor on an IBM system with an ATI RADEON 8500 All-In-Wonder video card. As with practically any monitor nowadays, the 9KLR is a PnP model, so there were no complications installing it. It did, however, require some setting adjustments before it was ready to test. The OSD is a push-button/wheel deal that works well but lacks an auto-adjust feature.

Diagnostic tests where the 9KLR performed best include the box linearity test (the results were quite sharp), the scaled fonts test (fonts of every size were comfortably readable), intensity level ramps (there was good gradation with both the color and the grayscale ramps), and the defocusing tests (these revealed extremely minor blooming and no halos).

The 9KLR didn't perform as well in the video bandwidth brightness test, where the thinnest black and white lines appeared gray. Nor did it pass the screen regulation test, where the screen experienced noticeable movement (not a good sign for serious gamers, but not a big deal for almost anyone else).

In practical testing, office applications looked as clear as I hoped for. High-resolution images displayed with Adobe Photoshop looked better than expected. Bright areas of the images weren't washed out, and shadowy areas weren't so dark that details became obscured. Our gilded cathedral test photo revealed nice, rich coloring, and our photo depicting a tulip field in a park proved how well the 9KLR could deliver highly realistic images.

Anyone looking for a respectable-looking 21-inch CRT without super-high-performance capabilities should consider the 9KLR. ▲

by Cal Clinchard

KDS XF-7b



XF-7b

\$169

KDS Computers

(800) 533-7515

(714) 379-5599

www.kdsusa.com



The XF-7b is a recent addition to KDS' line of Xflat, or Xtreme Flat, displays. It's a CRT monitor with a 17-inch (16-inch viewable), no-glare, flattened screen. It has a nice set of specs but didn't live up to my expectations, which were based on KDS' reputation for making some of the sharpest affordable LCDs around.

In diagnostic testing, I did find some high points, as the XF-7b exhibited no annoying defocusing effects, displayed text that was readable in all fonts and sizes tested, and had decent color registration, which indicates on-key color representation. The XF-7b also handled grayscale screens well, although I had to adjust the brightness from 50% to 100% to gain the appropriate balance. Color and grayscale ramps also showed an even gradation from light to dark.

On the down side, the screen regulation test revealed minor discernible screen movement, and in the video bandwidth and modulation test, the thinnest lines looked gray instead of

the intended stark black and white. The video bandwidth index was also a low 86, where the highest possible index is 100 and most good monitors muster at least 89 or 90.

Other tests fell into the OK camp. Focus and resolution matrices, white-level regulation test screens, and geometry test screens all looked OK. Word documents and Excel spreadsheets looked a little better than OK and showed on-key application coloring and clean, sharp text.

High-resolution images looked clear but a tad bright on the XF-7b. Changing the color temp from 9,300K to 6,500K made rich colors somewhat richer and less bright, but it sacrificed a degree of realism. Given the XF-7b's affordable price tag, however, its imperfections are forgivable. Look around online, and you'll easily find the XF-7b for a few dollars less than the \$169 MSRP. ▲

by Cal Clinchard

HP Deskjet 5550

Few marketing games are more aggravating than the ones companies use to hawk inkjets. "Check out the 4,800 x 1,200 resolution, man! Whoohoo!!" But I digress. I know companies such as HP have to find ways to push products such as the Deskjet 5550. I just wish they'd focus more on the products' real benefits rather than numerical trivialities.

There certainly are more notable things about the 5550 than its ridiculously high resolution rating. For one, the 5550 reaffirms HP as the only company to really take a chance with printer aesthetics. This one has a decidedly futuristic feel; the case resembles the hood on a wicked black-and-silver racecar.

That's a justifiable comparison, too, considering this printer's speed. It prints full-page photos on glossy paper in about three minutes. That's a mighty step for HP, as it helps the company challenge Canon's speed supremacy. Better yet, the 5550 presents excellent images with colors that are richer than I've seen from other HPs.

Other printing speeds were less impressive. Draft text printed at about 4.3ppm but featured better than average italic and bold print quality. Combinations of text and graphics slowed things considerably, as expected, but on the positive side, the odd intermittent banding I saw at first disappeared once I ran the nozzle cleaning cycle. There was still some minor banding, but it won't ruin your illustrations.

As HP's printers usually do, the 5550 smoothly paints solid-black areas in photos and other images. Plain-paper photos also looked better than average, with only slight banding.

Even when you remember that resolution is moot (you need absurdly huge files to engage the highest setting), this is still an excellent printer. With fast photo printing speeds and the option to use six-color photo inks, this one will find its way into many homes. ▲

by Nathan Chandler



Deskjet 5550

\$149

Hewlett-Packard

(800) 752-0900

(650) 857-1501

www.hp.com



Canon S530D Photo Printer

Photo printers with the capability to work PC-free tend to be clunky and downright expensive. I'm happy to say that Canon is on the right track with its S530D, a dedicated photo printer with all the gizmos but without the exorbitant price tag.

It will come as no surprise to you that this 2,400 x 1,200 printer (600dpi in black) prints quickly. That's Canon's game. I printed full-page photos in just a little more than a minute. Other document types printed at more average speeds. A six-page Word file with graphics and text printed in about 2:30 (minutes:seconds), while my three PowerPoint slides finished in less than a minute. Economy-mode text also had average print speeds; I printed a 10-page text file in about 90 seconds.

Rough-draft text quality was below average, even for a photo printer, with lots of rough edges. The flipside was that default-mode text was outstanding, surpassing even nonphoto printers in clarity and grace. Clip-art graphics

had smooth, accurate coloring, but I did note a bit of a moiré pattern that I don't usually see from Canons.

Plain-paper photos looked average, but glossy prints didn't quite cut the mustard. Although the colors seemed fine, these prints looked grainy, especially when compared to Canon's six-color models. Most users won't notice this problem, but photo enthusiasts will not be pleased.

As a result, this printer is best for novice shooters looking for a way to print photos quickly and easily using various connectivity options, including the flash card slot or direct connection USB port designed for Canon's PowerShot cameras. Though its glossy photos aren't perfect, the S530D is a fast, affordable printer for folks who like toys with all the fixings. ▲

by Nathan Chandler



S530D Photo Printer

\$249

Canon

(800) 652-2666

(714) 438-3000

www.usa.canon.com



Samsung SpinPoint SV1204H 120GB



SpinPoint SV1204H 120GB

\$149.99 (street price)

Samsung

(800) 726-7864

(201) 229-4000

www.samsungusa.com



Seagate and Western Digital hyped their 60GB-per-platter hard drives some time ago, but Samsung beat both companies to our door with its own 60GB-per-platter entrant. The 120GB SpinPoint SV1204H is part of the 5,400rpm V60 series of drives, which also includes 60GB and 80GB versions.

Areal density isn't the end of the drive's features, either. A 350G nonoperating 2ms shock tolerance and 29dB idle/31dB read-write noise levels show that Samsung knows toughness and quietness are essential.

In a rough sense, the Ultra ATA/100 SV1204H is on a performance level with Maxtor's 5,400rpm DiamondMax D540X 160GB. Although our initial tests didn't look so great, the benchmarks we recorded from this Samsung in a 1.8GHz P4 test system looked a lot better. This PC also had 512MB of PC800 Rambus memory and WinXP Pro.

The SV1204H led off with a 5,560KBps score in Winbench99's Business Disk test and finished with a 17,400KBps High-End Disk rating. Under HD Tach 2.61, this Samsung drive showed an expected increase in maximum read and write rates, with 39.1MBps and 23.8MBps, respectively. These rates are possible in a 5,400rpm drive because of the tightly packed data of its 60GB platters passing the read heads. The SV1204H's average read and write rates, 31.8MBps and 16.4MBps, look serviceable, as well, although far from the cutting edge. Like a previous pioneer in areal density, Seagate's sixth drive in its U Series, this Samsung seems to hesitate when finding necessary data. It reached a best random access time of 20.8ms, which is about 7ms or 8ms off the times of cutting edge 7,200rpm EIDE drives.

In all, the SpinPoint SV1204H 120GB looks like a candidate for inexpensive backup or storage duties, as in a quiet music server. ▲

by Marty Sems

TrekStor USA ThumbDrive Smart 16MB



ThumbDrive Smart 16MB

\$39

TrekStor USA

(925) 837-4506

www.thumbdrive.com



TrekStor USA's ThumbDrive has been around for a while, and it deserves to stay around longer. If you want a reliable small-storage option, the ThumbDrive Smart 16MB should do the trick; if you need more room, you can buy a larger-capacity version.

The ThumbDrive Smart uses the USB 1.1 specification and PnP functionality. If you have a system running Win98/98SE/2000/Me/XP or Mac OS 8.6/9.x/10.x that has a

USB port free, you can use this device right out of the box. Only Win98/98SE users have to go through an extra hoop and install the driver that's included on a CD.

The device uses your computer for power, and a tiny LED lets you know it's working. If you're using Windows, as soon as you pop the ThumbDrive in the port you can open Windows Explorer and see the new drive listed

with a new drive letter. You can then transfer data to the drive at 350KBps and read data from the drive at 700KBps. The fact that the ThumbDrive Smart works with both Windows and Mac makes it especially helpful for folks who work with both OSes. It weighs a mere 12 grams and comes with a key chain loop and pen-style clip for easy carrying.

I considered shaving points off my CPU rating for the ThumbDrive Smart because of its small 16MB size, but heck, you get what you pay for, and larger capacities are available. Other versions of the ThumbDrive Smart come with 8MB, 32MB, 64MB, and 128MB capacities, and sister devices, such as the ThumbDrive Touch and ThumbDrive Secure, incorporate security features. Additionally, TrekStor recently joined forces with IBM; the result is the IBM Memory Key, a 128MB USB 2.0 version. ▲

by Cal Clinchard

MicronPC Millennium XP+ Professional

The Millennium XP+ Professional from MicronPC is priced at \$1,474, and despite a couple of drawbacks, you just can't go wrong with this system. If your budget allows for a system in this price range, it's in your best interest to read more.

Specifications. Starting out with a 1.8GHz AMD Athlon XP processor, the Millennium XP+ Professional comes with 256MB of DDR RAM, which is upgradeable to 3GB. The hard drive has a capacity of 80GB and is made by Seagate (ST380021A). You'll also get an internal 56Kbps Micromodem (HSP56) and a 10/100 NVIDIA nForce MCP Ethernet card for your Internet connection.

Now for one of the drawbacks I mentioned earlier: The system only comes with a 24X/10X/40X CD-RW drive from NEC (NR-7900A). I've become accustomed to seeing machines in this price range with these kinds of specs offer a DVD-ROM drive. As the world of digital media grows, it's smart to consider adding that DVD-ROM drive to any system you're thinking about.

The monitor that comes with the system is a 17-inch CRT by NEC, the AccuSync 70. This monitor offers a nice picture, and the size makes viewing things easy on the eyes. But the video card has a definite drawback: The 32MB NVIDIA GeForce2 graphics card is integrated into the motherboard, which means that there's no DVI port for a flat-panel monitor.

The software package included with the Millennium XP+ Professional is more than nice; it's great. The system comes with Windows XP Home Edition, MS Works Suite 2002, Nero Burning, Pinnacle Studio Version 7SE, and Norton Antivirus 2002. Although this doesn't look like a long list, this is quality software that you'll actually use.

Design. The Millennium XP+ Professional is a minitower system that you can access by removing thumbscrews on the back of the case and pressing two release buttons. The interior is roomy, and if you need to work on the motherboard, you'll have plenty of space.

In addition, the system has five PCI slots (three available), one AGP slot (available), five 3.5-inch bays (three available), two 5.25-inch bays (one available), one serial port, one parallel

port, four USB ports (two in front and two in back), and three FireWire ports.

Performance. We ran the standard benchmarks on the Millennium XP+ Professional and received an overall SYSmark2002 rating of 177, with a 220 for Internet Content Creation and a 143 for Office Productivity. The second benchmark we ran was 3DMark-2001, and the system scored a 2,109. That's not as great as the SYSmark scores, but it's still indicative of a good system.

For some fun on a Friday afternoon, I played some Quake III at three resolutions: 800 x 600, 1,024 x 768, and 1,600 x 1,200. Game play was really good at 800 x 600 and 1,024 x 768, but the system couldn't play the game at 1,600 x 1,200.

And now for what I personally liked the best about this system, the audio setup. The system's audio card is an NVIDIA nForce MCP card that has Dolby Digital sound as an option if you have WinDVD. But that's not the best part; the best part is the 4.1 Altec Lansing (ADA885) speaker system, which includes four satellite speakers and a sub-woofer. One of the satellites has an LCD that displays the options for power, mode, bass, treble, and volume. There's also a remote control for the speakers. And last but not least, the sound quality was awesome.

Final word. The Millennium XP+ Professional system from MicronPC is a winner in most of the categories you should consider when purchasing a new system. The two drawbacks that I mentioned, no DVD-ROM drive or DVI port, aren't big enough for me to turn you away from this system. This is definitely a case where the positives outweigh the negatives. ▲

by Dana Montey



Millennia XP+ Professional

\$1,474

MicronPC

(888) 224-4247

(208) 893-8970

www.micronpc.com



Processor: AMD
Athlon XP
1.8GHz

RAM:
256MB DDR-
RAM

Hard Drive:
80GB

Optical Drive:
CD-RW

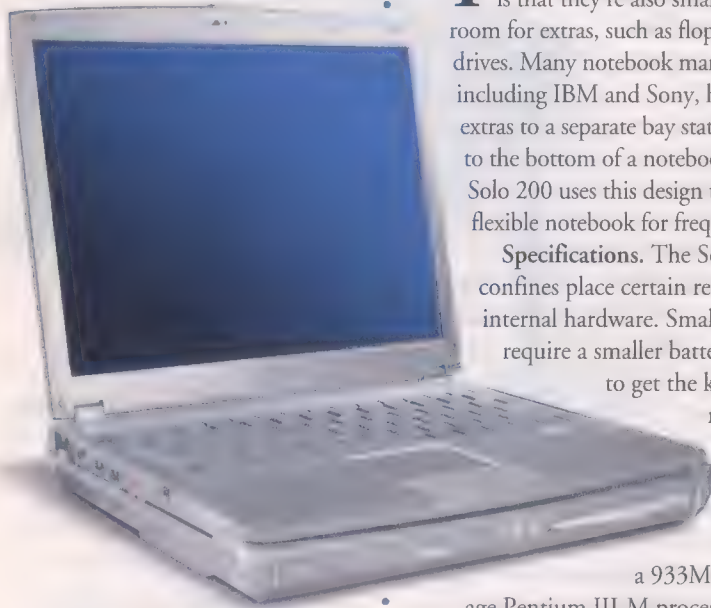
Connectivity:
Modem

Chassis Type: Minitower

System Use: Personal

Final Word: Great system; positives outweigh the negatives.

Gateway Solo 200



Gateway Solo 200

\$1,999

Gateway

(800) 846-4208

(858) 848-3401

www.gateway.com



Processor:

933MHz
Pentium III-M

RAM:

256MB/384MB

Display: 12.1-
inch TFT

Hard Drive:
20GB

Optical Drive:
DVD-ROM

Connectivity:

Modem; Ethernet;
802.11b

Weight (pounds): 5.37

Final Word: Flexible
system for frequent
travelers. Performance
could be better.

The problem with lightweight notebooks is that they're also small, leaving little room for extras, such as floppy or optical drives. Many notebook manufacturers, including IBM and Sony, have moved these extras to a separate bay station that can clip to the bottom of a notebook. Gateway's Solo 200 uses this design to provide a more flexible notebook for frequent travelers.

Specifications. The Solo 200's small confines place certain restrictions on the internal hardware. Smaller notebooks require a smaller battery, so if you want to get the kind of battery life

most users expect, you need to downgrade the processor. The Solo 200 includes

a 933MHz ultra-low volt-

age Pentium III-M processor and 256MB of SDRAM (upgradeable to 384MB).

The Solo 200's 20GB hard drive is a little cramped but isn't bad for its size and price. Our unit shipped with a modular DVD-ROM drive, but you can get a CD-RW drive or a combo drive if you prefer. Floppy drives are more dated than 9,600bps modems, but I was glad to see one on the Solo 200 (they're nice in an emergency). One design feature I wasn't crazy about is that the releases for both modular drives are on top of the docking station, forcing you to remove the system to remove either modular drive.

To save some space, the graphics chip uses a portion of system memory for video memory. This, of course, reduces your system's available memory and can slow down performance a bit. The 12.1-inch display is small, but it's the norm on smaller, lighter notebooks.

Networking options include the standard Ethernet and modem. In addition, the Solo 200 features integrated support for 802.11b.

Design. Without the base station, the Solo 200 measures 0.94 x 10.7 x 9.2 inches and weighs about 3 pounds. The base adds a little more than 2 pounds, bringing the system's total weight to 5.37 pounds.

Smaller notebooks simply don't have the room for larger displays, and you don't typically see displays larger than 12.1 inches in

notebooks lighter than 4 pounds. With a smaller display, you really don't need a higher resolution than the Solo 200's XGA (1,024 x 768) display. Personally, I prefer larger displays for DVD video, but if you're looking to lighten your travel load, you most likely will have to settle for a smaller display. There were no major glitches with DVD playback, although I encountered a short pause when switching layers on a DVD.

The dual speakers on the base station were better than a notebook's speakers. Still, the sound leaves a little something to be desired. Notebook users, however, are used to poor sound.

Performance. The 933MHz Pentium III-M can't quite keep up with the speedy processors in larger systems, but its ultra-low voltage processor provides for better battery life. MobileMark 2002 returned a Battery Life Rating of 152 minutes. From a performance standpoint, the Solo 200 is the first system we've tested with MobileMark that hasn't posted a score more than 100. It's Performance Rating of 96 is about 10 points below the 1.4GHz HP Presario 2801CL.

Comparing the Solo 200 to the Presario 2801CL isn't quite fair, however. Considering the Solo 200, like most notebooks lighter than 4 pounds, relies on a Pentium III-M processor, the gap in performance isn't too bad. A more fair comparison would probably be Sony's VAIO R505, which also weighs less than 5 pounds and utilizes a Pentium III-M processor.

PCMark2002 returned a CPU rating of 2,953 for the Solo 200, a Memory score of 1,827, and an HDD score of 356. The VAIO (with a 1.13GHz Pentium III-M processor) topped all these scores, posting a 3,549 CPU score, a 2,062 Memory score, and a 409 HDD score. Considering it's a few hundred megahertz faster than the Solo 200, these numbers aren't too bad.

Final word. The Solo 200 isn't made with performance in mind. Battery life and portability are the features that will attract most users to it. Performance will certainly be good enough for business use, and the system will even handle some multimedia chores. ▲

by Chad Denton

CPU Ranking: \ 0 = Absolutely Worthless \ 2.5 = Absolutely Average \ 5 = Absolutely Perfect

BRIDGE FOR SALE: \$150



Introducing the Harman Kardon DAL 150 ezlink™. It connects your PC to your home audio system—so you can listen to your computer's MP3 files with exceptional sound quality. For even better sound, use it with a Harman Kardon receiver with onboard MP3 decoding. For more information and to locate retailers, visit www.harmankardon.com or call 1.800.422.8027.

DarkSide PC HellFire



HellFire

\$2,300
DarkSide PC
(315) 853-3000
www.darksidepc.com



Processor: AMD
Athlon XP 2200+

RAM: 512MB
PC-3200 DDR

Hard Drive:
80GB

Optical Drive:
CD-RW;
DVD-ROM

Connectivity:
10/100 Ethernet

Chassis Type:
Midtower

System Use:
Entertainment

Final Word: Good
for gamers with mild
budgetary restraints.

Looking for a hellishly good new entry on the high-end PC market? DarkSide PC's HellFire is one system worth considering. It offers one of the best AMD-centric configurations going.

Specifications. The HellFire packs a lot under the hood, especially given its \$2,300 price tag, including a beautiful \$699 22-inch flat CRT monitor from NEC. The system has an AMD Athlon XP 2200+, which has a 1.8GHz clock speed but performs about as efficiently as a 2.2GHz Pentium 4. It has a 133MHz bus speed, 256KB L2 cache, and one 512MB DDR memory card.

The system has a modest 80GB Western Digital hard drive of the Ultra DMA variety and a standard 3.5-inch floppy drive. For optical drives, there is a 32X/12X/40X Mitsumi CD-RW and a 16X Toshiba DVD-ROM drive.

The multimedia selections are awesome. The system has a Leadtek A250 GeForce4 Ti 4600 video card with 128MB of DDR and a DVI port, a Creative Labs Sound Blaster Audigy sound card, and a practically unbeatable Klipsch six-piece speaker set that pumps out Dolby 5.1-channel Surround Sound.

The HellFire comes with the dynamic duo of RF input devices: a Logitech Cordless Freedom Optical keyboard and mouse. There's also a decent number of ports: two serial, one parallel, four USB, and one FireWire.

Design. If you're into fire and brimstone, the HellFire has your number. A red glow emanates from the black case, and the top front bulges outward as if there's so much power inside it's trying to escape. The demonic-looking case doesn't have gory innards, though. The ribbon cables are silver, round, and braided, and all the wires and cables are tucked neatly in place.

DarkSide also gets points for inventive fan use: 2CoolTek spider fan grills grace the PC's side window and top, and five Sunon Extreme 80mm case fans blow out the heat with maniacal frenzy. This undoubtedly prevents dust from settling inside but gives the same sound effect you'd

get from sitting near a 20-inch window fan. A Titan 80mm fan cools the CPU.

Unlike similar customized case mods, the HellFire's design offers easy accessibility and modest maneuvering room inside. Unfortunately, there are no free drive bays. Of the system's five PCI slots, three remain open. The best upgrade option addresses the system's memory; there are two slots available, and altogether you can pack a whopping 3GB of RAM onboard.

The system comes loaded with Windows XP Professional Edition and a healthy soup of useful software. The bundle includes some software that's a little off the beaten path, such as MicroStar's Fuzzy Logic 4 and Trend Micro's PC-Cillin, as well as some standards such as Nero 5 Burning ROM and Adobe Acrobat Reader.

Performance. I had no complaints about the system's performance. The combined power of the Creative Labs sound card and Klipsch speakers made me hungry to try an album in Super Audio CD format, but I stuck with one of my standbys. I spent awhile skipping around "The Matrix" on DVD; the system's playback was flawless, and the sharp, giant screen drew me in as if I'd taken the red pill.

The HellFire sailed through the SYSmark-2002 benchmarks. It scored a 224 in Internet Content Creation and 162 in Office Productivity for a total score of 190.

The system easily handled a few rounds of Quake III, but there was no surprise there, given that the system earned a 3DMark2001 score of 10,486 (and 10,983 with the Fuzzy Logic utility turned on). Faced with Quake III's Time Demo 1, the video card churned out a 204.4fps frame rate at 800 x 600, 197.7 at 1,024 x 768, and 142.2 at 1,600 x 1,200.

Final word. Because DarkSide PC is a relative newcomer to the online PC-selling biz, I can't attest to the helpfulness of its tech support. The company offers a warranty package that's comparable to the big-name PC makers: three years, parts and labor. I can say that I was impressed with the speed with which DarkSide PC thoughtfully crafted a system for my review; if that's any indication of the company's service, it should do well. ▲

by Cal Clinchard

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

A Little About Banias



Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today, CBS' 48 Hours and Fortune. His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.

I've always enjoyed IDF (Intel Developer Forum), simply because it is a very efficiently organized conference. There's no running around to 20 different hotel suites to make meetings; everything is presented to you in the mornings during the keynotes and then you fill in the blanks throughout the day.

The theme of the fall IDF this year was the convergence of consumer electronics (TVs, TiVos, stereos) and computers (PCs, notebooks, PDAs); the devices that are going to start to bridge this gap between unintelligent consumer electronics and PCs are things like notebooks and PDAs. Intel has put forth a great deal of effort into these mobile markets with the advent of mobile versions of their desktop processors and even custom solutions like the XScale processor for PDAs; unfortunately, this approach isn't perfect. In my description of Intel's efforts, I've actually outlined one of their biggest problems—their mobile processors are desktop CPUs scaled down for the mobile market. A notebook CPU should be made for the notebook market, not a watered-down version of a desktop CPU; Intel realized this just a couple of years ago and went ahead with a project known as Banias (pronounced BAN-ya-ss).

The idea behind Banias was to create a new microprocessor from scratch that would be optimized for use in the notebook market and would do away with a lot of the design considerations that were put into effect for the desktop market. The project was undertaken by Intel's Israel microprocessor design team and the results are just a matter of months away from being seen.

At IDF, Intel revealed a little more information about Banias, and I was able to piece together some more details about the yet-unannounced CPU. Banias will ship in the first half of next year (with a launch around January or February) as a 0.13-micron CPU with 77 million transistors; you'll note that this is more transistors than the Pentium 4. The high transistor count is a result of Banias' very large L2 cache, which I believe will be 1MB in size. The architecture of the Banias CPU can be

compared to a very unique Pentium III derivative. The way I picture it is as a Pentium III with a larger cache and a number of power-reducing and performance-enhancing features; one such feature is Banias' micro-ops fusion technology. Micro-ops fusion takes decoded instructions that would normally be sent down the execution pipeline and "fuses" them into larger bundles before sending them down the pipeline. This improves efficiency both on a power and performance basis, as the bundles are only "unfused" after they reach the execution units. There are many more features like this that not only optimize performance but also power consumption; for more information on them, be sure to visit my IDF coverage on AnandTech.com.

The frontside bus is actually borrowed from the Pentium 4, so you can expect to see a 400MHz FSB on Banias. The two Banias chipsets, Odem and Montara-GM, support DDR SDRAM, and from early indications, I believe the chipsets will sport a dual-channel DDR memory subsystem, which would make sense in order to feed the high-bandwidth FSB. Banias' FSB will also be highly optimized for low power consumption by being able to disable parts of

the FSB during inactivity. Both the Odem and Montara-GM chipsets will support integrated 802.11a and 802.11b wireless Ethernet.

Banias should be debuting at around 1.6GHz, and at that speed, it will actually outperform a Pentium 4-M at 1.6GHz. The combination of a much larger cache, a shorter pipeline and all of the Banias-specific architectural features will give the CPU a performance advantage over a similarly clocked Pentium 4; don't take this to mean that the fastest laptops will be Banias-based, as Pentium 4-M notebooks will be running at much higher clock speeds.

There are only a few months left before Banias' introduction, but at least now we know much of what we've been waiting for. ■

Anand's busy tinkering with hardware at Anand@cpumag.com.

Banias should be debuting at around 1.6GHz, and at that speed it will actually outperform a Pentium 4-M at 1.6GHz.

IDF Inventory

One of my favorite industry shows happens to be Intel Developer Forum, better known in these parts as IDF. A couple of times per year, us press jockeys get to mingle and jingle with top-brass engineers from Intel, as well as their partners. It's a great opportunity to just sit in on tech sessions and dissect upcoming technology that is more often than not many months away from actual production. Even without AMD's "official" presence (last IDF, the company scheduled "Hammer" demos at a hotel next door), the show still offers up a few intriguing nuggets. Feel included and better, don't ya? Good. Unfortunately, I can't tell you about my NDA meetings, but what I can let loose to you is this. . .

The current top-dog P4 2.8GHz, with a few tweaks, can easily crack 3GHz, but how does a Pentium 4 running at 4.6GHz sound to you? On the first day, Intel flexed its 0.13-micron Northwood P4 pecks with a 4.1GHz system. The clock speed was then jacked up and topped out at 4.64GHz. Super cooling, vapor phase refrigeration a la KryoTech, methinks? It's nice to know that even Intel knows a thing or two about overclocking. Don't expect a 4.64GHz P4 anytime soon, mind you, but it certainly sheds some light on just how much more headroom the P4 could have.

HyperThreading was also a soup du jour throughout the event, with various demonstrations of this upcoming technology being shown. P4 systems with HT (HyperThreading) technology enabled were shown running Asheron's Call 2 whilst simultaneously recording live telly. A more practical scenario was painted with PowerPoint running alongside a virus scanner. Rumors of a late Q4 introduction of this technology on P4s clocking in over the 3GHz barrier turned out to be spot on because Intel is indeed planning to release a 3.06GHz HT P4 in that timeframe. So if playing back video from a digital video camera and subsequently encoding it to MPEG-4 is your cup of tea, the future looks bright with HT. Better still, playing your favorite game whilst burning a Crystal Method compilation

CD for your in-car entertainment. . . So far executive presentation numbers have been thrown out there stating a performance gain of 25% for desktop P4s with HT, but it's going to be hard to

benchmark and replicate real-world scenarios that actually make sense to individual users.

It does seem apparent that after spending some time with an HT-enabled P4 system, there will be less waiting on load times and better multitasking performance, and not just with multithreaded applications, either.

But before you get too excited, don't expect "boosts" with game frame rates until game developers really get into multithreaded coding. . .

On the chipset and motherboard side, there are a couple of interesting developments to report on. First, those of you hoping for a new high-end replacement to the RDRAM-based i850E for the P4 are going to have to wait awhile yet. Intel's Dual-Channel DDR "Springdale" chipset won't be available until the middle of next year, apparently. Reports of Rambus' death are also untrue, as usual; the company was a "Gold Sponsor" at IDF this year. In the short term, Intel will be releasing three new P4 chipsets, and even more interesting was a prototype of its "Enthusiast" board. Decked out in a black PCB with six-channel audio, IEEE 1394, USB 2.0, RAID, and Serial ATA support, this is a far cry from the company's usual plain vanilla offerings.

Next month I promise to return with my usual sarcastic, often offensive, and utterly distasteful style. . . ■

Fire off an email to sharky@cpumag.com, and with HT enabled, you won't bog my PC.

Being a regular case review lacky here at CPU, I was pleasantly surprised by the case-mod section outside the show floor, which had on display some of the most bizarre and interesting concepts I've seen in a long time. My favorite has got to be this "Alien Concept" PC.



Disrupting Reuters' newswire with a cheery Christmas greeting at age six, Alex "Sharky" Ross became an avid computer user/labuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently swims in Silicon Valley.



Shifting Gears



Kyle Bennett is editor-in-chief of HardOCP.com, one of the largest and most outspoken PC-enthusiast sites on the Web. HardOCP.com is geared toward users with a passion for PCs and those who want to get cutting-edge performance from their systems. Beware, though, Kyle is known for his strong opinions and stating them in a no-nonsense manner while delivering some of the most in-depth reviews and PC hardware news on the 'Net.

Some things we stated here 60 days ago have changed, and changed greatly. I had been suggesting that you look into making an Intel CPU your next upgrade, but that has changed. Now don't get me wrong. If you have invested in an Intel platform on your desktop, I in no way feel it will come close to leaving you disappointed, but there are some new options opening up, as well as some doors seemingly closing.

I've been a strong advocate of the current Pentium 4 CPUs and mainboards, supporting them because from all the information we have access to, it seemed the Pentium 4 upgrade path was going to be a smooth one. Meaning that if you bought an Intel mainboard that currently supports a Pentium 4 Northwood core CPU, you should be able to upgrade that board to a 3GHz processor and beyond.

My thought was that it might be possible for it to carry you all the way to 4GHz of CPU power. Now there is information coming out of Taiwan that could possibly put a damper on this seemingly clear upgrade path. It's being said that in order for mainboards to support the 3GHz Pentium 4, they will need a new power supply. That's not to say you will need a new PSU in your box, but rather that the power-supply components on current mainboards aren't strong enough to deliver the power that will be needed by 3GHz Pentium 4s and beyond.

If this is true, it could not only muddy your upgrade path but also simply close that road to further travel in the event you wanted to go beyond the stock 3GHz level. We have contacted Intel directly on this issue, but Intel is in that "we can neither confirm nor deny" stage. How this plays out will certainly weigh on my suggesting Pentium 4 systems for the DIY guys out there, but we will simply have to wait and see what happens.

We at HardOCP.com have gotten hold of and tested the latest 2.8GHz Pentium 4 releases. We had no troubles overclocking it by 500MHz, well into the 3GHz range, with some simple water-cooling. Even with air-cooling, we managed a 350MHz

OC, which is something we can't complain about. So if you have migrated to an Intel platform, don't get worried, there is still a lot of fun to be had with a Pentium 4-powered box.

On the other CPU front, AMD has awoken from its slumber, or has rather awoken me from my AMD slumber. It has kicked off several new CPUs, its new flagship being the 2600+ Athlon XP running at 2.13GHz. We found it overclockable to right at 2.5GHz with air-cooling. This isn't the same Thoroughbred core that was launched with the somewhat disappointing 2200+. From what we've been able to figure out from AMD documentation, the TBred core

will not only be available on AMD's new 2400+ and 2600+ CPUs, but it seems as if the new core will migrate all the way back down to the 2000+ model CPUs operating at a stock 1.67GHz. If this is true, we may be seeing some very tweakable CPUs from AMD back on the market very soon, and that certainly has gotten our attention.

If you look at the pricing of these AMD CPUs, you will notice that they are going

to continue to be very inexpensive and possibly yield the greatest bang for the buck that the enthusiast is going to spend.

Also worthy of mention is AMD's next CPU core change and how I think it is going to affect the AMD upgrade path. Although AMD has yet to say much of anything to anyone about the upcoming Barton-core CPUs, the CPUs will almost assuredly have double the L2 cache of the current Athlon XPs. They will also be riding an increased bus speed of 333MHz. Although this in itself is exciting, we're told that Barton-core CPUs from AMD will likely work on most of the current Socket A mainboards in the market.

We'll know more soon, but right now I suggest you fully explore your options before spending that hard-earned green so you aren't spending even more a few months from now. ■

**We had
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overclocking it
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range, with some
simple
water-cooling.**

Talk with Kyle at kyle@cpumag.com.

Each month we ask a staff writer to take on our publication editor in a challenge to build the best PC for a certain price. Because our writers don't want to lose their jobs, they always accept this challenge willingly. Tempers will flare. Tools will fly. But only one will prevail.

This month the challenge is to build the
Best Graphics Design Workstation for less than \$2,000.

Samit

Hmmm, let's see: I don't do a whole lot of graphics design. I'm not a developer. And I know the word "nub" sounds titillating. No matter. I don't call myself Insidious for nuffin'; I chatted with a few game developers and did some lurking in graphics design forums to target my workstation focus. Oh, reacquainting myself with the cost of graphics design software was, as always, an eye-opener: 3D Studio Max (\$3,495), AutoCAD 2002 (\$3,395), LightWave Complete (\$1,595), Maya Complete (\$1,999), and SoftImage 3D|Xtreme (\$1,995) to name a few. With these high prices, it becomes obvious that the workstation is the paper and protractor, but the software is the brush and paint. I steered away from picking a graphics design app because each artist has a very personal software preference.

I set to work putting together a multiprocessor system running under

Windows XP Professional. The inclusion of the dual optical Logitech mouse for more accurate design was something I thought you might appreciate.

So . . . did you guys see our preview of the 3Dlabs P10 VPU on page 26 of the July 2002 issue? That led to my video card of choice: The 128MB Wildcat VP870 from 3Dlabs. I thought it did the trick for the price; besides, the V870 can handle any major graphics design app with aplomb. If you look carefully at the screen below, you'll see a number of OpenGL applications for which the card has already been optimized. And speaking of apps, the Bonus CD comes with a non-commercial version of Maya and several other graphics applications.

More RAM is always better, so I thought to include a single 512MB DDR, but you've got ample room for more (which I'd recommend). Considering the cost of software, you may consider the 24-inch Sony GDM-

FW900. Those on a real budget may opt for a 21-inch Sony CPD-G520P, which you can find rebadged in the \$570 range. That way you can use the Dual Head feature of the VP870. Either way, you'll be ready for the big time with this rig. C'mon Chud, bring it on, baby.

The Insidious One is ready to feed you to his dual CPU fans.



THE PC CHA



Samit Choudhuri
Publication Editor
Computer Power User

Component	Model	Price
Case	Directron ATX-AL-8850 Aluminum Mid-Tower with Enermax EG365P-VE P/S ¹	\$74
Motherboard	Tyan Tiger MPX S2466N-4M ²	\$197
Processor	AMD Athlon MP 2000+ Retail (x2) ³	\$314
Memory	512MB PC2100 DDR266 184-Pin ²	\$111
Hard Drive	Samsung 80GB 7200RPM Model# SP8004H (OEM) ³	\$95
Video Card	3Dlabs Wildcat VP870 128MB (Retail) ⁴	\$576
Sound Card	Creative Labs Soundblaster Live 5.1 (OEM) ³	\$32
Network Card	Integrated	N/A
Modem	Are you kidding?	N/A
CD-RW	Arteck CDRW 40x12x48x IDE ³	\$54
Diskette	Sony 1.44 FD (OEM) ³	\$9
Monitor	Envision EN-980 19-inch * ⁵	\$229.99
Speakers	Labtec Spin 20 ³	\$6
Mouse	Logitech MouseMan Dual Optical Mouse ⁶	\$34
Keyboard	Logitech Deluxe Access 104 PS/2 (OEM) ³	\$13
Operating System	Windows XP Professional Edition (OEM) ³	\$139
Software	Nero 5.5 (with CD-RW drive)	N/A
Miscellaneous	Silencer 4-pin Front Case Fan (1)	\$12
Subtotal		\$1,895.99
Shipping		\$63.70
Tax		\$14.95
Rebates		\$30
Total		\$1,944.64

Purchased From:
¹ Directron.com
² Micro Pro
³ Newegg.com
⁴ The 3DShop.com
⁵ CompUSA
⁶ EMS Computing

*Items with rebate

CHALLENGE



Chad Denton

Staff Writer

Computer Power User

Chad

Samit's been gettin' beat down a bit lately, so I have to wonder if assigning me to put together a graphics workstation isn't an attempt to reclaim his now fleeting glory. Let's face it, asking me to assemble a graphics

workstation is a bit like asking G' Dub to properly pronounce "nuclear." I mean, I just figured out how to add text to an image in LView Pro and was pretty proud of myself.

Eventually, I put the conspiracy theories behind me and started thinking about the task at hand. (After all, it wasn't like they were asking me to *sketch* a PC.) A graphics workstation without Adobe Photoshop is like an episode of "Buffy" without Alyson Hannigan. (I mean, what's the point?) I also had to have a digital tablet. Although Wacom is the leader in the digital tablet market, I opted for an Aiptek 8-inch x 6-inch tablet over a smaller and more expensive Wacom Intuous2 tablet. If I hadn't chickened out while downloading Photoshop 7 from Warez'R'Us, I probably would've gone with a larger Intuous2 tablet.

In order to run Photoshop effectively, I couldn't compromise too much on the hardware. The Athlon XP 2200+ processor I chose seems more than capable of powering Photoshop. With a larger budget, I would've picked up 1,024MB of DDR SDRAM, but I settled for a single stick of 512MB. The



DIGITAL TABLET NOT PICTURED.

AOpen AK77 motherboard includes support for Ultra ATA/133 hard drives and comes with a 333MHz frontside bus.

The 60GB Maxtor hard drive takes advantage of the Ultra ATA/133 support on the motherboard and should provide plenty of storage space. Just in case, I included a CD-RW drive complete with Nero for archiving work. It was either Photoshop or a TFT display, so I opted for a 19-inch Samsung 955DF. The flat screen is easier on the eyes, has an excellent resolution, and causes less distortion than a typical CRT.

I scored a midtower with a 300W power supply for \$26. The case was what I expected for \$26 (poorly designed), but the extra cash came in handy. The only way a GeForce4 was fitting into my budget was if I hid it under my coat as I walked out of Best Buy. The challenge said nothing about 3D graphics, so I stayed on the right side of the law and picked up a solid 2D card, the Matrox Millennium G550.

All this and I still have enough money left over to keep my inner starving artist on a diet of ramen noodles for another three months.

Component	Model	Price
Case	LinkWorld 313B with 300W PSU ²	\$26
Motherboard	AOpen AK77-333 VIA KT333 333MHz FSB; USB 2.0; AC97 Sound ¹	\$77
Processor	AMD Athlon XP 2200+ ¹	\$157.29
Memory	512MB PC2700 333MHz Non-ECC ¹	\$128.70
Hard Drive	Maxtor 60GB EIDE U-ATA133 7200RPM ^{1*}	\$119.99
Video Card	Matrox Millennium G550 ¹	\$98
Sound Card	N/A	N/A
Network Card	Netgear FA311 10/100 Ethernet ^{1*}	\$9.99
Modem	AOpen PCI V.92 Fax Modem ²	\$16
CD-RW	AOpen CDRW3248 32X/12X/48X ¹	\$46
Diskette	1.44MB floppy drive ²	\$8.73
Monitor	Samsung 955DF DynaFlat (1,600 x 1,200; 0.20mm dot pitch) ^{3*}	\$299.99
Speakers	Creative Labs SBS15 Speakers ¹	\$9.99
Mouse	included with digital tablet	N/A
Keyboard	Logitech Internet Keyboard ²	\$15.10
Operating System	Windows XP Home ¹	\$89
Software	Adobe Photoshop ³	\$649.99
Miscellaneous	Aiptek HyperPen 8000U USB Tablet ⁴	\$89.99
	Cooler Master HHC-001 Heatsink ¹	\$35
Subtotal		\$1,876.76
Shipping		\$45.32
Tax		\$76.05
Rebates		\$85
Total		\$1,913.13

Purchased From:

¹ Mwave.com

² Wiredzone.com

³ BestBuy

⁴ BestBuy.com

*Items with rebate

And The Winner Is...

The rumor around here is that the Insidious One has gone soft, and it's hard to refute. He's had his Athlon handed to him two months in a row. To pour water on his dwindling fire, IO went and got himself married last week. So, while this month's PC Challenge was beckoning him, Mr. I Do was tying cute, lace bows on invitations, dieting to fit his tux, and ripping wedding songs so fuzzy they made my bald head disturbingly warm all over. The question is: Will the Choud return to glory against Chad or just fade into domestic bliss? This battle has drama, people. On the exterior, Chad and Samit's rigs are much alike. Samit's Logi is the better rodent (and that matters this month), but Chad includes a tablet (good thinking), although Samit has some dough left over to buy one. Inside, they opted for the same CPU and memory amounts but decidedly different graphics cards. Samit gets the hard edge there. Samit also tops Chad in hard drive space, but both include a CD-RW, so that's a bit of a push. Photoshop awaits you on Chad's system. I was more excited about Maya being onboard Samit's machine until I saw "learning version." Samit gets the hardware win, Chad the software. So who wins overall? Samit. To use Chad's 2D vs. 3D argument, no one said this challenge was about the software. It's about the machine.



Blaine

"Celebrating His Wedding Anniversary This Week" Flamig

X-ray Vision: JMTek's USBDrive Professional

Empty your pockets! Go ahead, let's see what's in there. Looks like the usual suspects: billfold, keys, pocket change, cell phone, stray receipts. But it appears you're way behind the times. If you aren't carrying hundreds of megabytes of data in your pockets these days on a USB flash memory drive, you're no longer the king of technology in your circle.

Although several companies make tiny USB flash memory drives that you can use with your computer to store important data, JMTek (www.jmtek.com) seems to be paving the way in this arena with its USBDrive Professional. This removable drive is about the size of a couple of sticks of gum stacked together, but it's the device's features—not its size—that set it apart from other removable USB drives.

The Key Is The Extras

The USBDrive Pro not only stores data (ranging from 64MB to 1GB, depending on the model you choose), but it lets you do more with that data than similar flash memory USB drives from other vendors.

USB-Lock. This feature prevents others from gaining unauthorized access to your PC whenever the USBDrive Pro is disconnected. Whenever you remove the USBDrive Pro, you can set the PC to lock up. According to your settings, the PC will unlock after a certain period or it will unlock the next time you insert the USBDrive Pro and enter a password. If you lose your USBDrive Pro, the locking feature can be removed via password.

Ahmad Aqqad, the technology director at JMTek, says the USB-Lock feature gives your notebook or desktop computer protection features similar to a keyhole on a door. "If you don't want to log out or shut down your laptop,

you just unplug the USBDrive Pro, and, voila, it's locked," he says. "It's an affordable access control device."

USB-Mail. The USBDrive Pro's email client lets you manage your email from any PC connection. USB-Mail is a POP3 and SMTP email client. The email client software resides on the USBDrive Pro. As soon as you make an Internet connection, you can manage your email through USBDrive Pro. The added advantage to USB-Mail is the security of your email messages; all of your communications are stored securely on the

USBDrive Pro, away from prying eyes on your desktop computer. "The whole idea was to mobilize that privacy," Aqqad says.

The USB-Mail feature only works from the USBDrive Pro device. If you try to copy USB-Mail to a hard drive, the feature will not work. USB-Mail is flexible, offering the ability to import some address data from your current email program. You can include as many attachments as you want to a message generated through USB-Mail. "You and I are hooked on email," Aqqad says. "Without email, we'd probably die. We

Flash Memory's Role

The USBDrive Pro uses flash memory to store data. Flash memory consists of columns and rows of cells. Within each cell are two transistors, called the control gate and the floating gate. A thin oxide layer separates them.

When the control gate

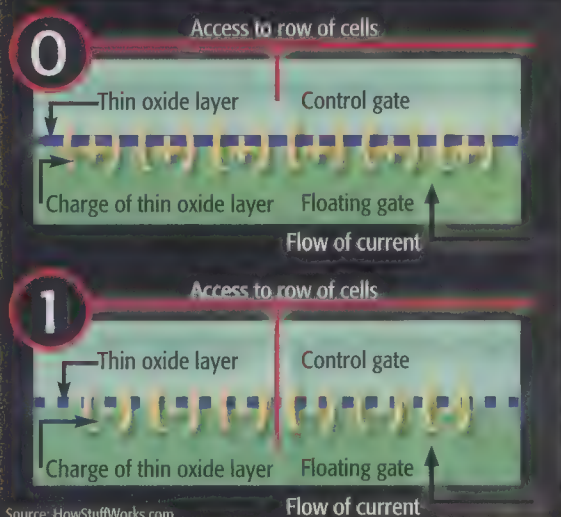
access to the row of cells, the cell has a value of "1." This is the normal state of the cells.

To change the value of the cell to "0," negatively charged electrons are added to the floating gate. The electrons change the thin oxide layer's charge to negative and make the thin oxide layer a barrier to the

floating gate's access to the row of cells.

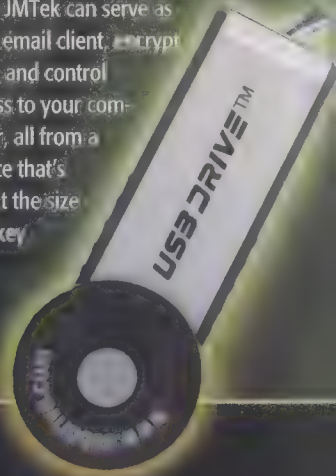
The cell can return to "1" when a higher-voltage charge is applied to the cell causing the cell to reset.

One advantage of flash memory is its ability to maintain its data without a continuous source of external electrical power.



Source: HowStuffWorks.com

The USBDrive Professional from JMTek can serve as your email client, encrypt data, and control access to your computer, all from a device that's about the size of a key.



HARD HAT AREA

figured, let's include an email client on [the USBDrive Pro] and make it more of an Internet device.

USB-SecureZip. For data protection on the USBDrive Pro itself, the device can automatically encrypt or compress your data, making the data only readable through the USB-SecureZip software that resides on your PC. The compression program provides the added benefit of giving you additional storage space on the device.

Both the encryption and compression features run through a password. The encryption through USB-SecureZip uses a triple DES algorithm, which should provide enough data protection for most users. It can compress data to about 30% to 40% of its original size, leaving a slightly larger file than you'd find with an average encryption program made for the desktop computer. If you lose your

USBDrive Pro, someone else would have to match your password to gain access to the encrypted or compressed data.

What You Don't Get

The USBDrive Pro will work with all versions of Windows newer than Windows 98. You will have to install drivers for Win98 SE, however, and JMtek says the drive will not work with the first version of Win98. USBDrive Pro will work with newer versions of Linux (version 2.4.24 and up) and Macintosh (version 9 and up).

The USBDrive Pro ships with a cap that protects the USB connector and doubles as a pocket clip. After removing and replacing the cap several times, though, the cap might become a little loose. You can carry the USBDrive Pro with a neck strap or a key chain clip, too.

Network administrators will want to think twice before letting users connect the devices. Because of their small size and high storage capacity, it would be easy for any employee—or any visitor—with access to the network to connect the USBDrive Pro and make off with several large files. You can use an optional feature of the USBDrive Pro, an overall device password, to protect the data on the drive, but many people might find the password feature a little cumbersome and decide not to use it. This means the drive wouldn't have the benefit of the highest level of available data protection.

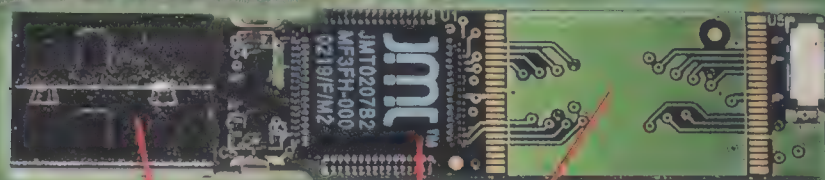
Flexing Its Flexibility

In addition to its many features, the USBDrive Pro offers a couple of other advantages, including its sturdy construction. It's unaffected by magnetic fields or dust. (However, JMtek recommends not subjecting the drive to prolonged periods of high humidity or heavy physical or electrical shock. We can't argue with that logic.) It can transfer data at about 1MBps under ideal conditions, but more realistic transfer speeds are 250KB to 500KB per second.

To think, it wasn't that long ago that we hauled stacks of diskettes when we needed to carry data from computer to computer. You could stack diskettes to the ceiling and still not match the storage capacity in a single USBDrive Pro. And the next time your diskette can manage your email or automatically encrypt or compress your data will be the first time.

The 64MB version of the USBDrive Pro costs \$80, and you'll pay \$120 for the 128MB version. 256MB costs \$200, 512MB costs \$350, and 1GB costs \$700. The USBDrive Pro does carry a higher price tag, usually about \$50 more than similar competitors' USB flash memory storage models, but its flexibility is unmatched. **CPU**

Inside The USBDrive Pro



The USB connector connects the PC to the USBDrive Pro.

A printed circuit board on the back end of the device connects all of the components.

The USBDrive Pro's die package contains the device's processor.

The device's die package is located inside the MCU (micro-controller unit) and serves as the CPU for the USBDrive Pro. It's a 64-pin processor inside a LQFP (Low-Profile Quad FlatPack).

On the opposite side of the circuit board is the flash memory component, which serves as the USBDrive Pro's storage component. TSOP (Thin Small Outline Package) packaging houses the flash memory.

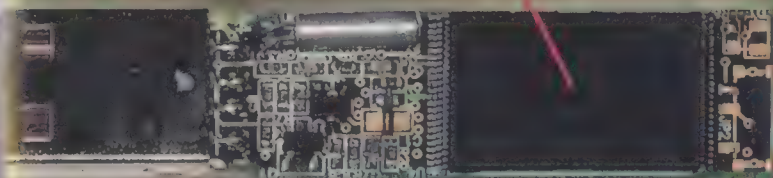


PHOTO COURTESY OF JMTEK

Graphics & Design: Ginger Riley & Ned Day

by Kyle Schurman

HyperTransport Technology

Developing An Inside Job

The ability of microprocessor manufacturers to keep up with Moore's Law has been a boon to computer users everywhere. Moore's Law says the number of transistors on the microprocessor should double every 18 months, and these ever-faster microprocessors give computer users access to new avenues of computing power.

One problem has consistently appeared as faster microprocessors have debuted, though, leading to increasing problems. Improvements in the I/O bus system that supports data movement within the microprocessor and between its components has been unable to match the speed improvements made in the microprocessor. The demands of technologies such as 3D graphics, streaming video, high-speed networking, and multiple-processor systems have further taxed the bus systems. Once such technologies grab their share of the bus bandwidth, little remains for other types of technologies, such as USB or MP3 audio.

In the late 1990s, developers began looking for a new bus technology that could improve the I/O bus speeds before they became a major drag on the development of microprocessors. AMD began working on solving the I/O bus problem by developing its HyperTransport technology in 1997. The promise of HyperTransport caused several companies, including Apple Computer, Cisco Systems, NVIDIA, and Sun Microsystems, to join AMD in creating the HyperTransport Consortium (www.hypertransport.org) in mid-2001. HyperTransport is now poised to give I/O buses a major boost in performance and speed, letting them keep up with microprocessors. (Intel is supporting a competing I/O bus technology called PCI Express, previously called 3GIO. See page 48 of the June *CPU* for more information on this technology.)

Hurry, Hurry!

Much as you might expect from the name, there's nothing sloth-like

about HyperTransport technology. In its basic form, HyperTransport provides high-speed, high-performance links for integrated circuits. Data throughput speeds can reach 12.8GBps, but only when developers employ the top clock speed of 800MHz, the top link width of 32 bits, and DDR memory signaling. Under other configurations, HyperTransport will reach lower data throughput speeds. For comparison, the PCI standard, which commonly appears in today's computers, typically reaches bandwidth speeds of about 266MBps. In addition to HyperTransport, other, newer bus standards are faster than PCI, too, including PCI-X at between 1GBps and 4GBps, AGP8X at about 2.1GBps, and PCI Express at about 10GBps.

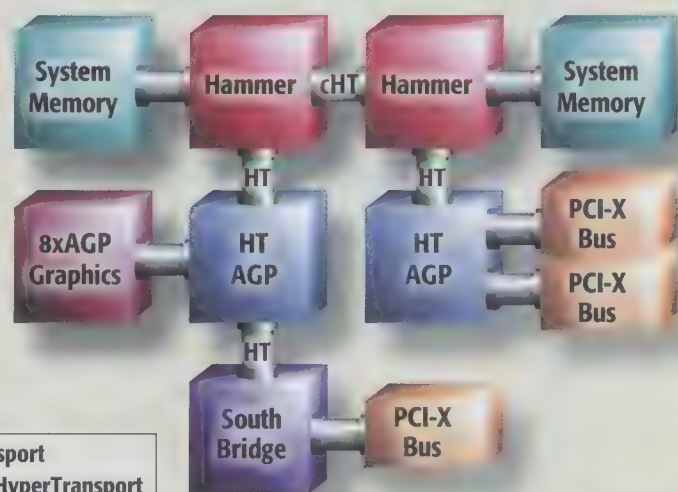
Developers created HyperTransport technology to enable the chips inside computers to communicate with each other much faster. With the improved communication speeds, systems require fewer buses. Developers also have designed HyperTransport to be scalable,

Dual-Processor System With Coherent HyperTransport

In this example, a system contains two AMD Hammer processors. The processors each contain an integrated memory controller, and individual system memory components connect to each processor. The processors connect to each other using a cHT (coherent HyperTransport) bus. The cHT bus is an offshoot of HyperTransport technology that supports memory coherence, allowing for the most efficient sharing of memory data between the two processors. General HT (HyperTransport) buses then connect the processors to the remainder of the system.

The processor on the left uses the tunneling feature of HyperTransport technology to create a bridge with AGP and a connection with the south bridge on the same chain.

The processor on the right supports two PCI-X buses with its PCI-X bridge. Both HyperTransport chains can support the maximum bandwidth that the connected components could demand.

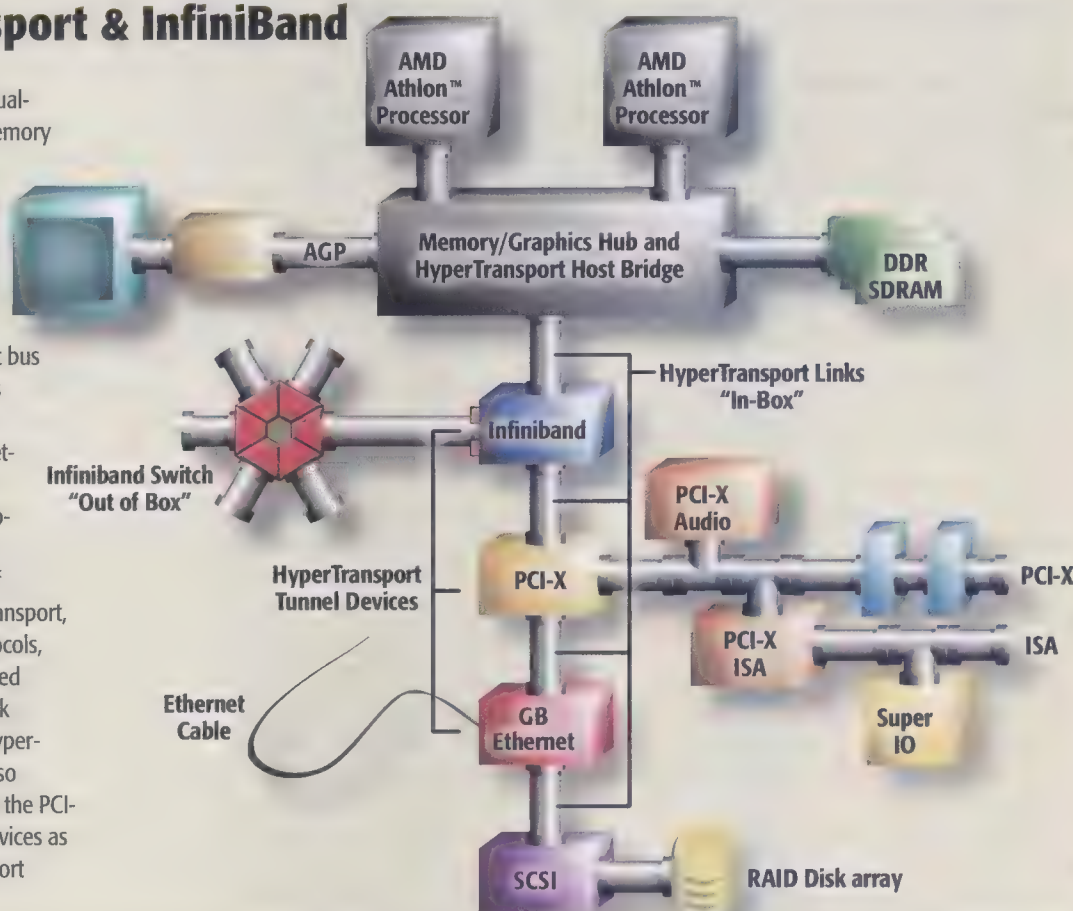


HT=HyperTransport
cHT=coherent HyperTransport

SOURCE: HYPERTRANSPORT.ORG

HyperTransport & InfiniBand

In this example of a dual-processor, shared-memory system, HyperTransport and InfiniBand technologies complement each other to deliver high-speed, reliable data processing. The HyperTransport bus handles the connections between the memory/graphics hub and the network controller, which uses InfiniBand technology for the external I/O bus. The combination of InfiniBand and HyperTransport, which share many protocols, can deliver the high-speed needs of today's network server environments. HyperTransport technology also makes connections with the PCI-X, Ethernet, and SCSI devices as part of the HyperTransport tunneling feature.



SOURCE: HYPERTRANSPORT.ORG

meaning it should help provide a bridge between older bus standards, such as PCI, and emerging bus standards, such as InfiniBand Architecture.

Although past I/O bus technology ramped up its bandwidth simply by creating a wider bus, the continual shrinking of the interior components of the PC has made this technique impractical. Designers looking for a new bus technology to provide improved bandwidth and speeds while remaining small enough to be practical will give HyperTransport technology a strong look. As an added bonus, HyperTransport runs at high clock speeds while maintaining its narrow bus. HyperTransport also requires less electrical power than older bus technologies, giving designers less concern over cooling problems. In addition to helping the computing industry, HyperTransport

could benefit the networking and telecommunications industries.

HyperTransport offers full compatibility with the PCI bus interface, which, along with PCI-X buses and network controllers, is what most of today's computing systems use. Although the HyperTransport bus is much narrower than a standard PCI bus, its ability to send data more quickly—usually about 48 times as fast as PCI—more than makes up for the narrower bus.

Faster Than PCI

HyperTransport can achieve much higher clock speeds than PCI for a variety of reasons.

Extra, extra. In a PCI bus, the architecture requires extra dedicated pins and traces for specific types of information, including addresses, data, and commands. Because the pins

only can carry the type of information for which they're dedicated, they could be sitting idle during any particular clock cycle. HyperTransport sends all types of information along the same pins and traces. It also sends data in chunks (similar to the way an Ethernet network sends data), using a process called a packetized bus, to make the most efficient use of the width of the bus.

Flexibility through tunnels. When chaining together several HyperTransport devices, the technology makes use of a tunnel device. A tunnel, which is a device that sits in between two HyperTransport-connected devices, is a building block for adding other HyperTransport devices and for creating a chain. The tunnel serves as a go-between for the other devices, giving them a connection to the host. The use

HyperTransport Bandwidth Scalability

Designers can scale HyperTransport's bandwidth to fit the needs of a particular component. Here's a comparison of the data transfer rates found when combining available HyperTransport clock rates with link widths. (Applying DDR memory signaling would double the potential data transfer rates listed here.)

	Link Width	2 bits	4 bits	8 bits	16 bits	32 bits
Clock Rate	200MHz	0.1GBps	0.2GBps	0.4GBps	0.8GBps	1.6GBps
	400MHz	0.2GBps	0.4GBps	0.8GBps	1.6GBps	3.2GBps
	500MHz	0.25GBps	0.5GBps	1.0GBps	2.0GBps	4.0GBps
	600MHz	0.3GBps	0.6GBps	1.2GBps	2.4GBps	4.8GBps
	800MHz	0.4GBps	0.8GBps	1.6GBps	3.2GBps	6.4GBps

SOURCE: HYPERTRANSPORT.ORG

of a tunnel gives HyperTransport added flexibility in design topology over PCI.

Going it alone. PCI uses a shared bus architecture, meaning its overall clock speed slows when more than one device is using the bus. The HyperTransport architecture makes use of direct, dedicated links between two devices, meaning devices are connected directly through one bus, making the bandwidth and clock speed faster.

The shortest route. When designing a system board or other component that uses buses, designers have more flexibility with a narrow bus, such as HyperTransport. A wider bus can cause some additional layers and meandering routings, which lead to slower data transfers and higher design costs than a narrow bus and, subsequently, a more direct routing.

Signaling Specifics

HyperTransport technology's I/O link consists of two point-to-point, unidirectional links, or the area along which the data moves. Within each link, the technology allows about 1.6 billion data transfers per second per pin pair. HyperTransport employs a technique called **differential signaling** when transferring data. Differential signaling uses two wires when transferring each signal. When the signals reach their destination, the difference between the two signals is calculated, leading to the actual data result. Differential signaling is an advantageous technique because it cuts down on signaling errors that can be common in other types of high-speed buses, including interference, bounced signals, and cross talk from adjacent signals.

As an added benefit of running differential signals, HyperTransport is able to use a form of LVDS (Low Voltage Differential Signaling). Because it's using two signals to carry each data bit, HyperTransport uses far less power than other types of I/O buses, making LVDS an option.

HyperTransport LVDS actually uses lower voltages than typical LVDS, which will allow HyperTransport to better adjust to projected future demands in computing components. LVDS also supports a high frequency signal, which explains HyperTransport's ability to support clock speeds as fast as 800MHz.

Newfound Flexibility

All of the signaling techniques used in HyperTransport reduce latency and give designers plenty of flexibility in creating buses for a component. HyperTransport links can be about 24 inches in length, giving designers plenty of leeway in creating bus layouts.

Designers using HyperTransport links also can vary the width of the data paths in the bus or the clock speed, depending on the specific needs of the component. This scalability gives designers the option of sacrificing some performance for a gain in power savings, for example (see the HyperTransport Bandwidth Scalability chart). Scalability is a key component in letting HyperTransport

HyperTransport Specs

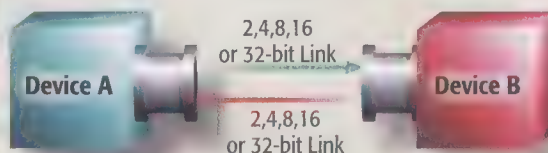
Here are the specifications for each feature contained in HyperTransport technology.

Feature	Specs
Bus type	Dual, unidirectional, point-to-point links
Link width	2, 4, 8, 16, or 32 bits
Protocol	Packet based, in multiples of 4 bytes
Bandwidth	100MBps to 6,400MBps (each direction)
Data signaling speed	400Mhz to 800MHz (up to 1.6GHz with DDR)
Duplex	Full
Multiprocessing support	Yes
Memory model	Coherent and noncoherent

SOURCE: HYPERTRANSPORT.ORG

HyperTransport: The Basics

HyperTransport is a full duplex bus. One of the two links between two devices ■ HyperTransport bus connects uploads data, while the other link is for downloading. Links can be 2, 4, 8, 16, or 32 bits in width. This flexibility in bus width lets developers save money when deploying HyperTransport, giving them the opportunity to match the bus width to the needs of the devices involved in the connection. Developers don't need to waste money using a 32-bit bus when a 4-bit bus will meet the needs of the devices, for example.



SOURCE: HYPERTRANSPORT.ORG

HyperTransport Milestones

1997. AMD begins working on HyperTransport technology, code-named LDT (Lightning Data Transfer).

June 2000. HyperTransport technology presentation occurs at Platform 2000.

June 2001. NVIDIA announces first HyperTransport-based South Bridge.

2002. AMD announces plans to include HyperTransport technology in its eighth-generation processor core.

1999. First public presentation on HyperTransport technology.

Early 2001. Altera is the first PLD family to support HyperTransport.

July 2001. HyperTransport Consortium launches.

SOURCE: HYPERTRANSPORT.ORG

technology support several different types of buses within a system, too, such as a mixture of PCI buses and network controllers.

HyperTransport Guidelines

When creating HyperTransport, developers had several goals in mind:

Improve system performance

- Increase the I/O bandwidth
- Move slower devices out of the way of critical paths
- Reduce number of buses
- Reduce latency
- Reduce power consumption

Simplify system design

- Use a common protocol for connections
- Reduce the number of pins in use
- Support for varying upstream and downstream bandwidth requirements

Maintain compatibility

- Support existing OSes and drivers
- Complement standard buses
- Offer extension to new system network architecture buses

Potential applications

- Routers
- PCs
- Hubs
- Set-top boxes
- Switches
- Handheld devices
- Servers
- Gaming consoles
- Workstations
- Embedded systems

SOURCE: HYPERTRANSPORT.ORG

Because of the technologies built into the protocol layer of HyperTransport, designers can use varying clock speeds or varying path widths within the same component. Thanks to the protocol layer—which manages the variations—no special I/O drivers are needed to make up for the variations the designer creates.

Look Ma, fewer pins! HyperTransport requires fewer pins—and, consequently, fewer parts—than other types of I/O buses, which saves manufacturing costs. By using a less-than 32-bit bus, designers can save additional money in manufacturing costs. This feature provides a significant cost savings to developers. The use of fewer pins also reduces EMI (electromagnetic interference), which can give designers plenty of headaches, especially when laying out a circuit board design.

Finally, HyperTransport technology provides flexibility in giving designers an option when connecting the power supply to the link. HyperTransport supports connecting the power supply to either side of the link, while older bus technologies require that a power supply be connected to both sides of the link.

Friends To The End

As we've described, HyperTransport works on improving the internal I/O bus. For work outside the internal I/O bus, HyperTransport supports and works in conjunction with InfiniBand Architecture, which is a technology designed to improve the performance of the external I/O bus. Companies supporting InfiniBand have formed the InfiniBand Trade Association (www.infinibandta.org).

These two technologies work well in tandem, especially when employed in a network server environment. Because of the large data requirements many network servers encounter on a regular basis, fast and reliable bus architectures between the network controller and the system memory are vital. HyperTransport can handle the internal link's need for speed, while InfiniBand's work with the external link complements HyperTransport.

In fact, many of HyperTransport's protocols and features have complementary protocols and features in InfiniBand, letting the two technologies work well together. The two technologies also share certain operations. For example, HyperTransport easily can pass a complementary operation to InfiniBand, which produces less latency than reconfiguring the operation for use with another type of bus technology would. The two types of technologies also support similar types of error detection, further reducing latency.

The inside work of HyperTransport coupled with the outside work of InfiniBand looks like a strong contributor to future improvements in system architectures. As NBA fans—and, in particular, Los Angeles Laker fans, at least in the past few years—can tell you, matching a strong inside game with a sharp outside game makes for an almost unbeatable combination. **CPU**

by Kyle Schurman

See www.smartcomputing.com/cpumag/nov02/hypertransport for more on this new bus technology.

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MOBO MAYHEM

The Motherboard Market Under The Microscope

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Like your old car, home theater, or even "Survivor," your current motherboard probably needs an overhaul. Today's new boards feature lots of evolutions, a few tiny revolutions, and modern design approaches that make the chaotic patchwork of connectors and capacitors from yesteryear look positively Paleolithic. Not all boards are created equal, though, and an unwary buyer can be easily stung. What makes a good mobo design? Which features really matter? Let's find out.

Among the hottest features now:

- **SATA.** As you read this, Serial ATA should be available on boards via third-party chips, and primary chipset vendors should be shipping chips with SATA integrated. Don't expect huge performance boosts in SATA's first generation, but the tech's roadmap shows huge increases over the next few years.
- **AGP 8X.** At this writing, ATI's RADEON 9700 is the only released card supporting AGP 3.0. More 8X cards will follow, but it will take time for apps to leverage the additional speed. Workstations may have need for 8X immediately, but don't expect 8X to become a desktop staple for several months.
- **USB 2.0.** If you're looking at a board without Hi-Speed USB, stop. You can live with slow video if necessary, but transferring

20GB of MP3 files to a USB 1.1 jukebox involves enough thumb-twiddling to leave you with two bloody stumps.

Aside from the core technologies, mobo vendors try to cultivate their own must-have features. EPoX integrates an onboard debugger card with alphanumeric code readout, and MSI is experimenting with Bluetooth and Wi-Fi adapters. Other enhancements include overclocking utilities, BIOS firewalls, Windows-based BIOS updates, and four-channel RAID controllers.

NVIDIA's nForce family continues to blend mainstream and next-gen features. Best known for its midrange integrated graphics, nForce's lesser-known architectural innovations, such as dual memory controllers to reduce RAM processing latency and integrated Dolby Digital encoding, have all the makings of a high-end performance offering priced for value buyers.

The nForce2 platform is also enabling new system functionality through such innovations as using twin Ethernet controllers to let the PC act as a gateway without the expense of extra hardware. As home networking gains more momentum, such board-level integration may become one of next year's essential features.

Design Now & Then

Motherboard distribution costs have dropped nearly 25% since last year. This is good news for consumers, but price-cutting can negatively affect product quality. Board-level conflicts, such as one PCI slot interfering with another, become increasingly common because vendors lack the resources for proper R&D and post-production testing. Another problem is insufficient time between product cycles.

"In the past, you would have a model or processor that would be in the market for maybe a year," says Gary Tam, Gigabyte product manager. "These days, with all of the competing chipset vendors, we're starting to see the life cycle shrink down to only three months."

Pressure to lower full system price tags is driving the market toward highly integrated chipsets and boards. ISA slots are gone; serial and parallel ports aren't far behind. Mounted ports have replaced CNR and AMR adapters. As more board features

consolidate, the smaller micro-ATX form factor is gaining ground on full-size ATX. EPoX's Sam Kang expects this trend to continue until PCs become wearable and motherboards fit in the palm of your hand.

The commodification of the mainstream mobo market means features and pricing



have largely stabilized. That's great for product stability but doesn't exactly draw crowds of onlookers. Thus, some manufacturers are turning to mixing function with flair.

"The modding market is so enamored with transparent chassis that board aesthetics are becoming very popular," says James Campbell, VIA Technologies marketing specialist. "SOYO... launched a platinum edition of its KT333 board with purple PCI slots. It's meant to attract the enthusiast user, and it's being very successful."

Can You Spot A Weak Board?

Even though most mobos have become apparent clones of one another, there can be substantial differences in quality. The cheapest mobos use two-layer PCBs, generally considered too thin to adequately protect a board's wires. High-quality boards sport capacitors and chips laid out in straight lines. Good manufacturers often use larger capacitors and more resistors for better, more stable electrical flow, especially with today's high-core voltages.

Some signs of poor workmanship are subtler. The average user doesn't know there is a difference among board components and that names like Tyco, Foxconn, and Molex are hallmarks of high quality.

Boards sent back to the factory for repair or that have failed a first post-production quality check often have solder balls and wire tracers. Avoid these at all costs.

Poor component centering is another sign of poor workmanship. White outline marks show where major chips and board features should be planted on the PCB. If a component is too far out of alignment, test equipment will flag the board as a reject because misaligned parts often result in shorts and other defects. However, vendors pinching pennies may still sell them.

"I look for a rev number like 0.0 or 1.0," Kang says. "The higher the number, the more the board has been revised. Finding the current revision is hard to do, though. You might need to call the manufacturer. A few list it on their Web sites. If the board... is three revisions out of date, be worried."

Kang says boards will have barcodes and QC stickers denoting ample checks through the production process. He advises to look at board feature placement and think of how you'll use the product. Will you be forced to drape wires over hot memory modules or a heat sink? Are there lots of resistors next to the CPU socket that you might damage when installing a heat sink?

Weeding Hot From Hype

This fall, DDR333 is a must-have, right? Not necessarily. Despite that the majority of chipsets aimed at fall 2002 motherboards are DDR333-compatible, MSI's Brandon Lu Tran states that 90% of the DDR modules being bought now are still DDR266. Less than 10% are DDR333, in part because there is less than 10% performance difference between the two formats.

"We might see DDR333 in the mainstream by the end of this year," says George Alfs, Intel spokesperson. "DDR400 will follow next year, but by that time we'll already be getting into dual DDR, and DDR2 will follow in 2004."

Heavily integrated chipsets (those with built-in 3D video and audio functionality) are viewed as hot and hype depending on the viewer's perspective. Performance users are likely to feel let down by integrated graphics performance. The nForce2 only performs at the level of a GeForce4 MX. The AC'97 audio built into practically every modern south bridge supports 5.1

output but has no capacity for environmental effects. However, third-party C-Media audio chips, which offer almost the same performance as today's Sound Blaster, cost mobo vendors less than \$2, and VIA is now working on board-level audio processing.

"According to Dataquest," says Lu Tran, "in 2001, there were about 11 million graphics cards sold in the U.S." He adds, "by 2005, it will be about half that. The reason is that integrated graphics are becoming more and more powerful and catching up to AGP for 3D games." When it happens, he says, add-on cards will prove to have no value outside of the

upgrade market. The same story is true with audio."

Opinions also vary on onboard RAID. Abit's Jeremy Smith (who calls boards with dual BIOS "frivolous") says RAID adds substantial value for little money, even if it's used in its just-a-bunch-of-drives configuration and not for speed/data redundancy.

The hype list goes on. Alfs says built-in FireWire support is largely unneeded now that camcorders are featuring USB 2.0 ports and most FireWire peripherals come in USB 2.0 versions. In some cases, hype turns into hot. MSI currently makes a lot of noise about bundling Bluetooth and

Wi-Fi, but relatively few users need this—yet.

Vendors can also turn hot into hype. Kang recalls one vendor integrating a mobo feature that overclocked automatically. "It was a BIOS application that increased the CPU speed, and it burned up a lot of CPUs," says Kang.

For nongamers, the integrated boards you'll see by year's end will offer great value on stable platforms. Upgraders should find a well-designed board with the most cutting-edge features supported. **CPU**

by William Van Winkle

What's Next in Chipsets

Have you devoured today's latest mobo features but crave more? Sit tight. Tomorrow's chipsets are jumping from the drawing board into production.

Intel

Springdale, Intel's follow-up to the 845G, is expected to go into production the first half of 2003 and support today's P4 (Northwood) and the forthcoming Prescott generation, slated to jump to a 667MHz frontside bus.

On the north bridge side, Springdale will support dual DDR333 channels, raising the memory bandwidth to 5.3GBps. The integrated graphics core (when offered on select models) will move from the 845G's GeForce2 MX level to roughly that of a GeForce4 MX. This won't stun power users, but Intel has another graphics core upgrade set for later that year. Springdale also supports an external AGP 8X connection.

On the south bridge (what Intel calls the ICH5 [I/O Controller Hub 5]), Springdale will embrace Serial ATA, eight USB 2.0 ports, and software-based RAID. In addition to today's ICH networking features,

Springdale will take on a wireless LAN controller. The

smart money is on 802.11b, but that could change by next year.

AMD

The Hammer processor family, which natively supports 32-bit and 64-bit code without a crippling emulation mode, is the anticipated successor to Athlon. AMD will have a chipset, the AMD-8000 family, to ease the CPU into the market. The 8000 is composed of the AMD-8111 I/O hub (the traditional south bridge), the AMD-8131 I/O Bus Tunnel, and the AMD-8151 Graphics Tunnel.

The I/O hub assumes the south bridge's role. In fact, the 8111 is almost identical to today's south bridge designs, save for an upgrade to six USB 2.0 ports and the 800MBps HyperTransport link. (Currently, the 8111 doesn't specify FireWire and only supports ATA/133.) However, the north bridge is gone. The "K8" accelerates system performance by integrating the DDR333 memory controller directly into the processor. The 8151 module controls the graphics bus function, and AMD uses a 6.4GBps HyperTransport link between the 8151 and the CPU that's scalable up to 12.8GBps for future processor



enhancements. The 8131 controls the PCI-X bus, a doubling of the conventional PCI bus to 133MHz with up to 1GBps transfer rates.

VIA

Most major chipset vendors are working on Hammer-generation products, but probably none is anticipated more than VIA's K8T400. According to VIA's James Campbell, the K8T400 is done and waiting for the Q4 release of Hammer to launch. The K8T400 preserves the old north and south bridge monikers while keeping the new Hammer design modifications. The K8T400 north bridge is essentially just an AGP 8X controller sitting on a HyperTransport bus, while on paper the VT8235 south bridge looks to be a clone of the AMD-8111, although VIA anticipates an update to Serial ATA by Hammer's release and another upgrade to wireless LAN

functionality in the following quarter. FireWire will be omitted.

Connecting the north and south bridges is VIA's 8X V-Link, "a proprietary link... designed to stop third-party chipset makers from leveraging our south bridge," says Campbell.

"For example, ATI could put its own north bridge on a board and use our south bridge if we didn't have a proprietary link. It has to license our V-Link technology in order to buy our south bridge. It's absolutely the same reason behind Intel's design. If we used HyperTransport for this link, we wouldn't have this ability."

VIA will also be active on the Intel platform with its P4X600. The company's legendary north bridge DDR memory controller will ramp up to dual-channel DDR333 while continuing to support AGP 8X and a 400/533MHz front-side bus. An 8X V-Link connects down to the same VT8235 south bridge used on the Hammer platform. Much as we hope to see the P4X600 scream into the U.S. market, VIA has yet to resolve its legal problems with Intel, which never granted VIA a license to produce P4 chipsets. **▲**

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INTEL MOBOS

The Best For Your P4

Gamers really have it rough these days. \$200 to \$300 will buy you a twin turbo fast P4. It's even over-clockable, if you have the right platform. And now there are so many platforms from which to choose. The P4 has matured well enough that Intel chipsets are no longer the only game in town. SiS, VIA, ATI, and ALI have all chimed in, and thus the consumer is left with some rather difficult choices.

Our purpose here is to compare high-end chipset options for the P4 and make board selections for each top-performing chipset based on features and value. Test results are provided for general comparison information only: This is a high-end roundup, not a frame-splitting shootout. Our minimum chipset/board specs include: 533MHz FSB, AGP4X slot, and USB 2.0. Feature options include: AGP8X, fast RAM, Serial ATA, ATA/133, RAID, FireWire, 5.1 sound, LAN, and "tweakability." Extra credit for software bundle, custom hardware goodies, and even design elements.

Only enthusiast and high-end OEMs were invited, but each was allowed to choose the products it wished to submit. Many decided not to compete in each category, perhaps due to a product's age or availability, so this is not a comprehensive testing of all boards made, but the best of the best as the OEMs see themselves. We derived pricing comparisons from a survey of PriceWatch.com. Street prices are timely and volatile; we suggest you research your selections before making a final decision.

Intel i845E Chipset

Since its Q2 release, Intel's i845E chipset has rapidly become the de facto

"mainstream" platform of choice for P4 users. Any OEM worth its weight in Taiwan has an i845E board on offer. The i845E is basically an updated i845. The 593-pin FCPGA 82845E MCH north bridge brings 533MHz FSB support for faster P4s and an "improved" memory controller hub for DDR266. Intel's strict validation process did not see fit to allow the i845E to boast DDR333 support, so officially you're stuck at DDR266. But some of the more innovative OEMs, such as ABIT, AOpen, and ASUS, do try to overcome this.

You can crank up that DDR266 to higher levels with simple BIOS tweaks, but there's no guarantee, and so once again, Intel is a little late on the ball here. Expect this to change with a "revamp" soon. Incidentally the i845G, which has been less popular thanks to the higher prices due to on-board graphics, can physically work with DDR333. But you end up paying for graphics that you don't use. There is no AGP 8X support, so 4X will have to suffice.

The i845E also includes Intel's ICH4 south bridge with an integrated USB 2.0 controller, able to support six USB 2.0/1.1 ports. USB's peak transfer rate is boosted from 12Mbps to 480Mbps, in case you are interested. On-board LAN and AC '97 six-channel sound are fully inclusive, but due to Intel's apparent preference for Serial ATA, there is no ATA/133 controller and instead a couple of ATA/100s. Of course you'll find optional RAID controllers and the like from

various manufacturers. OEMs are fighting for every penny, and the increased die size of the ICH4 does make it more expensive. Hence, you will sometimes find OEMs providing an ICH2 south bridge instead.

The i845E is probably your best bet in terms of variety of options and numbers of mainboards to choose from, even if it doesn't offer the fastest DDR performance. You will end up finding at least a couple of

boards that best suit your needs, as well as optional goodies such as FireWire, Bluetooth, a MediaXP unit, or even Vacuum Tube sound. For real gamers wanting every last fps who don't want to go the RDRAM route, there are obviously faster DDR333/400 solutions

available, even if boards themselves are much harder to come by.

Intel i845E OEM Board Winners

The i845E scene is probably the most sought-after by mainboard OEMs, but there is a top dog here, and that honor goes to ABIT's IT7-Max2. This board has absolutely every possible feature, including RAID, Serial ATA and FireWire. In case that isn't enough, you can combine it with ABIT's Media XP unit, which serves as a front panel I/O connector and has drives for Compact Flash, Microdrive, and Memory Stick standards.

The IT7-Max2 is also the only board in this roundup that is "legacy free" (other than a floppy connector) and hence its faceplate is markedly different. High-end



Intel i845E chipset

users have moved away from parallel and serial ports in favor of faster USB and FireWire standards, which makes for a less cluttered layout and allows room for more modern features instead. Its High Point HPT374 controller allows for RAID 0, RAID 1, and RAID 0+1 arrays, but you can have a total of 12 drives if you want. Although Serial ATA drives aren't slated to go live until next year, ABIT wisely chose to include it and bundle its SERILLEL adapter for use with today's hard drives.

Overclocking was very much pioneered by ABIT way back when, and this latest incarnation carries on that tradition, thanks to the company's "SoftMenu" BIOS, which lets you select different voltages, FSBs, and all kinds of memory settings, including CAS 1.5! To help you along, ABIT has positioned a diagnostic LED display to the right of the four PCI slots. When you boot up, the LEDs display different stages of the boot sequence, which comes in handy when you've pushed things a little too far. You simply look up the number code in the manual, and it tells you where it all went wrong. The company has also just launched a new online RMA service, which could prove to be an excellent idea for those tech support issues. At \$170, it's not cheap, but it is remarkably cheerful. ASUS' P4B533-E was a strong contender but just misses out due to a lack of Serial ATA support. But the ASUS "Q-Fan" feature that regulates your CPU's fan according to how much you are stressing the system is groovy.

A cheaper and almost as cheerful alternative that wins out in the "best value" category is the AOpen AX4B-533 Plus. It has most features you'd want, including Serial ATA and excellent overclocking capabilities. The only gripes are the lack of RAID and FireWire, but for only \$130, that's pretty forgivable. Although the lower-priced FIC VC19 offers RAID in lieu of Serial ATA, it is less capable in the tweaking department. Tyan's board, with its onboard Rage XL graphics, is targeted as an all-in-one solution for the corporate sector, and if you happen to be assessing your options for the work place, then the Trinity makes sense, but at a \$185 premium.

Enthusiasts should avoid Intel's D845EBT. With no real BIOS options

available for overclocking, the board, which does offer great stability, is plainer than the other choices in this roundup. Enthusiast/high-end OEMs Gigabyte, EPoX, MSI, and SOYO have also released i845-based boards but they chose not to compete in this category. You can also find nonenthusiast offerings from ACORP, BIOSTAR, Chaintech, DFI, ECS, FastFame, Iwill, Jetway, Legend QDI, Soltek, Transcend, and ZIDA.

Honorable mention. The zaniest i845 mainboard to come in is AOpen's AX4B-533 Tube (\$250). Sound buffs will get a kick out of AOpen's use of "Vacuum Tube" technology instead of modern-day capacitors. Because of the focus on "Tubes," there is only room for three PCI slots, which you might end up using because there is no Serial ATA, ATA/133, RAID, or FireWire support. The gold passive chipset cooler makes the entire board look dressed to kill. The "bling bling" award has to go to AOpen. Serious audiophiles only need apply.

VIA Apollo P4X400 Chipset

VIA is currently dominant in both performance and market share on the Athlon side of the fence, but where the P4 is concerned, things are a little more complicated. VIA has designed three DDR-based chipsets for the P4 in recent times, including the VIA Apollo P4X400, P4X333, and P4266A. But despite excellent performance, VIA has not yet managed to grab any sort of market share. VIA and Intel may not be on the same page regarding the P4 BUS license but nonetheless, the P4X400 in

current form is one of the most promising and interesting DDR platforms available for a 533MHz FSB P4. (It also works with older 400MHz FSB P4s.) Its predecessor, the P4X333, never saw the light of day but did bring support for AGP 8X, as well as DDR333MHz SDRAM to the table. The

Memory Options

If DDR is the way you wish to fly, i845E-, SiS 648-, and VIA P4XB-based boards each support the standard to varying degrees. Least exciting has to be the i845E, which has only been validated for use with DDR266 (PC2100). DDR266 effectively runs at 133MHz double pumped but is already on the way out with DDR333 (166MHz frequency) quickly encroaching into the mainstream. This is where the VIA and SiS solutions become more viable and zippy platforms.

JEDEC (www.jedec.org) has yet to officially recognize the DDR400 (200MHz frequency) standard, but the industry, always ahead of itself, is already awash with vendors selling unofficial PC3200 memory sticks. Only the SiS 648 and VIA P4XB400 platforms provide "unofficial" support. Right now, the sweet spot is for 256MB DDR333 DIMMS, which can be had from Mushkin, Kingston, and Crucial for roughly \$150 each. Dual Channel DDR and DDR-II isn't going to have chipset support until Intel's "Springdale" launches next year. With all RAM, CAS memory timing is key, so don't settle for CAS-3 memory timings and make sure you get the faster CAS-2 or at least 2.5. Often DDR333 CAS-3 can be slower than DDR266 CAS-2 because the chipset issues a read command on the third rising edge of the clock instead of the second.

On the RDRAM side, there are three choices of memory: PC800, PC1066, and the newer dual channel RIMM4200. The first two are single channel and can present disadvantages where high memory configurations are concerned. PC800 systems can be outrun by aggressively tuned DDR systems, but PC1066 and RIMM4200 PCs are a different tale. There is no faster way to run a P4 than to do so with these faster RDRAM modules. Admittedly, RAMBUS is being shunted out of roadmaps by Intel, so be aware that this route will probably result in a dead end eventually.

	Bandwidth	Frequency
DDR266	2.1GBps	133MHz x 2
DDR333	2.7GBps	166MHz x 2
DDR400	3.2GBps	200MHz x 2
PC800 (16-bit)	1.6GBps	400MHz x 2
PC800 (in pairs)	3.2GBps	400MHz x 2
PC1066 (in pairs)	4.2GBps	533MHz x 2
RIMM4200	4.2GBps	533MHz x 2

* As a point of reference, the Pentium 4 offers 4.2GBps worth of bandwidth at the frequency of your choosing.

P4X400's 664-pin BGA VT8754 north bridge goes one further by adding support for DDR400 and is able to achieve a theoretical peak bandwidth of 3.2GBps as a result. A maximum 32GB worth of memory is apparently possible.

The super-fab 487-pin VT8235 south bridge delivers ATA/133 support, letting each IDE controller zip along at 133MBps. USB 2.0, a VIA MAC for 10/100Mbps Ethernet, integrated PCI support, six-channel Surround Sound VT1616 AC'97 audio codec, and MC-97 modem are also part of the package. To tackle the PCI BUS bottleneck, VIA claims supremacy with its 8X VLINK technology. Bus bandwidth between the north and south bridge rumbles along at 133MHz quad-pumped, effectively 533MBps. I/O is done with VIA's VT1212 I/O chip, but if there's one item missing on the shopping list, it's FireWire, which admittedly OEMs can choose to add on externally for an extra cost, and that's exactly what VIA has done on its own board.

The major factor holding back this chipset is the lack of available motherboards. Only SOYO, Shuttle, VIA, and Soltek have opted to sell retail boards thus far, with other OEMs taking a "wait and

see" approach to the ongoing legal disputes with Intel. Enthusiasts would likely queue up should this chipset ever hit primetime.

VIA Apollo P4X400 OEM Board Winners

VIA P4X400-based boards are not exactly plentiful; in fact, only two products (of the six listed on VIA's site) came in for review: VIA's own P4PB 400 and SOYO's P4X400 Dragon Ultra. Political reasons aside, end users are missing out on the best DDR performing platform for the P4 with proper support for DDR333, as well as the ability to throw in even faster DDR400. In fact, SOYO and memory maker Mushkin have been doing the marketing/press rounds promoting their support for DDR400 with the Dragon board.

The BIOS for each board offers an impressive array of options for overclocking and tweaking; the main difference between boards is SOYO's offering of RAID in place of VIA's FireWire choice. Your priority between these two options will probably determine your final choice. Unless you are a frequent DV-cam-with-FireWire user, we think that RAID offers more value for the money and is more widely used; hence the nod just goes to SOYO. 5.1 audio with

VIA's VT1616 chip provides onboard sound that will almost make you wish you'd saved the \$100 you spent on that Audigy. The rear panel features S/PDIF and optical outputs for you to mess around with.

If your goal is to stick with DDR memory and get as close to the i850E in terms of performance, either board will get the job done, and cheaply (compared to the i850), too. You can find VIA's for \$145, putting it No. 1 in the value category, while you can pick up SOYO's for \$155. Shuttle has released two P4X400 boards, which it did not include in the competition. There are two offerings from Soltek, as well.

SiS 648 Chipset

Silicon Integrated Systems has somewhat of a rocky history in the chipset business. In the past it offered value (low-cost) solutions, but with little competition coming from other chipset companies for the P4 platform, SiS has really played a great game of catch-up. The most popular non-Intel chipset among mainboard OEMs has proven to be the SiS 648. The north bridge has been improved since the SiS 645DX days, with support for AGP 3.0 (aka AGP8X) and its 2GBps bandwidth, making it ideal for those of you thinking ahead



How Our Mobos Match Up

Here are benchmark results for the boards in each chipset category that we thought had the best features and best value. To see benchmarks for all the boards we tested in this roundup, see www.smartcomputing.com/cpumag/nov02/intelmobos.

Chipset	Motherboard	Comanche 4 (fps)	Jedi Knight II (fps)	Quake III Arena (fps)	PCMark 2002 (CPU:memory)
Intel i845E	ABIT IT7-Max2	48	104	293	6209:5179
	AOpen AX4B-533 Plus	47	106	289	6204:5176
VIA P4X400	SOYO P4X400 Dragon Ultra	51	113	322	6212:6332
	VIA P4PB 400	51	112	320	6209:6335
SiS 648	Shuttle AS45GT/R	48	109	312	6203:6316
	Shuttle AS45GT/R	48	109	312	6203:6316
Intel i850E	ASUS P4T533	51	115	330	6195:6745
	MSI MS-6545 850E Max	51	116	327	6185:6740



to NV30. With 533MHz FSB support, all the fastest P4s will work fine and dandy. The memory controller has also been improved over the 645DX and offers support for DDR266, as well as the faster DDR333, which will dish out 2.7GBps of memory bandwidth. Unofficially, some 648-based boards are capable of running even newer and faster DDR400 memory.

The 648 is paired with SiS' 963 south bridge, a feature-rich teaming akin to what nForce is for the AMD platform. The list is impressive, including dual ATA/133 IDE controllers, support for USB 2.0 ports (up to six), FireWire (maximum of three), integrated Ethernet MAC, and AC'97 audio (with six-channel audio capabilities). Linking the north bridge and south bridge together is SiS' proprietary MuTIOL (Multithreaded I/O Link) 16-bit chipset interconnect, which offers a max of 1GBps of bandwidth. MuTIOL is roughly twice as zippy as VIA's V-Link and quadruples Intel's Accelerated Hub creations. But the truth is, all the PCI, FireWire/USB, and IDE device usage on the board isn't likely to tap out the 963's 1GBps.

With such a fully loaded and forward-looking chipset, it's no wonder that SiS has been able to succeed with so many OEM

partners for the 658. But would you be able to go with SiS and forgive its past instability issues? Will it take more than a simple BIOS update to enable future P4 Hyper-Threading? For us, the first answer is yes,



The SiS 648

and the second one is a "who knows?". In many ways, SiS has been leading the way where early adoption of technology is concerned with the Pentium 4, and in that respect, Intel is playing catch-up.

SiS 648 OEM Board Winners

From our batch of three high-strung, SiS-powered mainboards, the Shuttle AS45GT/R and the ASUS P4S8X are perhaps a notch or two above the EPoX. All three come fully loaded with RAID, FireWire, and ATA/133. The EPoX's lack of Serial ATA and lesser tweakability rating gives the other two the edge. The ASUS brand inspires a little more confidence within the enthusiast community, as the company has been doing it and doing it well for years. But don't let that make you overlook Shuttle's offering. In fact, its BIOS options are just as "playful" as the ASUS offering, although the additional DIP switches on the ASUS certainly give you that "fail safe" option when your PC won't boot.

Tweakers have to get the most out of SiS 648-based boards in order to keep up with the i850E, and with Shuttle's board, DDR400 works "unofficially." The ASUS and EPoX boards do offer one extra PCI slot (totaling six), but with so many goodies on board already, it's doubtful that many would be needed. ASUS' layout and software bundle is, as usual, superb. It's a close call here, but the nod goes to Shuttle's

AS45GT/R, largely based upon the included three FireWire ports over ASUS P4S8X's six USB ports, and its \$105 price in comparison to the ASUS at \$135, which means Shuttle also wins out in the "best value" department. EPoX's 4SDA5+ is right in the middle at \$112. Enthusiast OEMs ABIT, AOpen, Gigabyte, MSI, and SOYO have also made SiS 648 boards but did not include them in submissions for this roundup. Other SiS 648 OEMs include BIOSTAR, DFI, ECS, and PCChips.

Honorable mention. Shuttle's XPC SS51G (reviewed on page 18) at \$345 is not exactly cheap for a SiS 651-based micro-ATX board with only an AGP slot and one PCI slot, but with its tiny case, power supply, and ICE technology cooling system, it might be worth a look as a "second" PC or for someone short on space.

Intel i850E Chipset

The i850E chipset dates back to Q2 of 2002 but is still the top performer, especially when it comes to gaming. In order to facilitate the faster 533MHz (or quad-pumped 133MHz) FSB-capable P4s, Intel released the i850E chipset. The i850E MCH chip is the same one on the older i850 and i845 and is coupled with Intel's ICH2 system I/O south bridge. Nevertheless, by comparison, its feature set looks decidedly dated and is long overdue for an overhaul. Many of the OEMs we approached decided against sending an i850E-based product and opted for the i845E.

The north bridge, the MCH (Memory Controller Hub), sports two memory channels for a total of four RIMMS and also provides the AGP 4X interface. Officially, only PC800 is supported, and so maximum theoretical peak bandwidth is 3.2GBps. But if you are the kind to go the unofficial route, you will quickly realize that 4.2GBps is possible with faster PC1066. 4.2GBps actually matches the theoretical peak bandwidth of the 4.2GBps-hungry Pentium 4. ASUS has gone one step further to provide support for dual-channel RDRAM but so far it is the only company to do so.

The bandwidth pipe between the north and south bridge hubs is a rather poxy 266MBps, when compared to the rest of the gang. ICH2 facilitates a pair of ATA/100 IDE channels, a LAN interface,

*Tested on a WinXP Pro P4 2.53GHz



3DMark 2001 SE (Marks)

Category

11035
10986

Features
Value

11731
11698

Features
Value

11410
11410

Features
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12387
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Features
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2000

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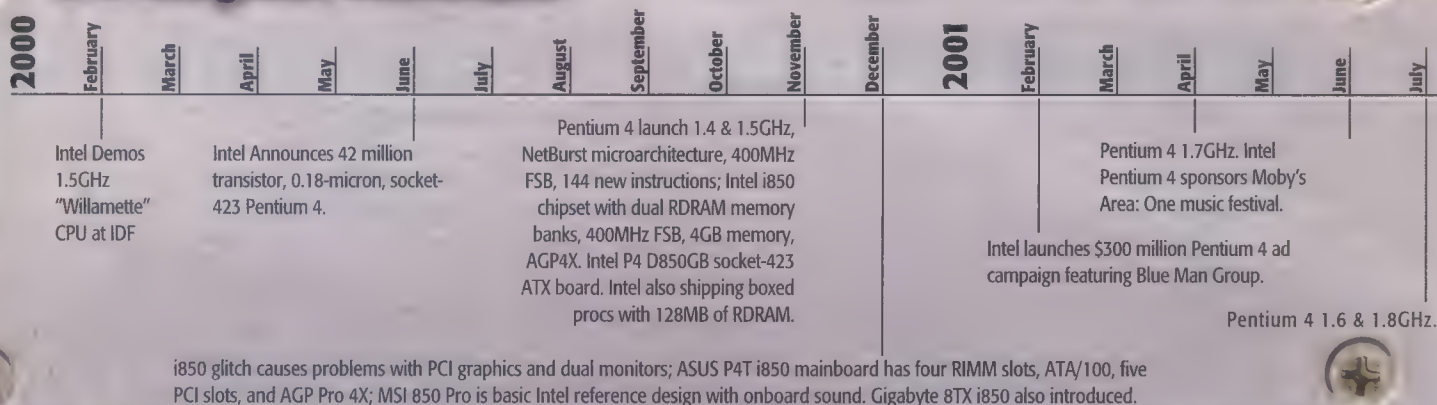
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5

P4 Chipset Timeline



5

5

5

5

NVIDIA discovered the first time around with its nForce for AMD platforms. ATI's north bridge consists of the RADEON IGP and an asynchronous 64-bit DDR200/266 memory (DDR333 is a future thought) controller with 2.1GBps available on a single channel. Onboard graphics are provided by a 128-bit 3D/2D integrated RADEON VE with a 4MB to 64MB frame buffer (SMI mode) shared with system memory.

The south bridge can use an optional ATI IPX (I/O communication processor), which will harbor benefits from its A-Link (double the bandwidth of PCI) connectivity to the IGP north bridge. OEMs can also choose to leverage their existing engineering investment in a third-party south bridge. The I/O functions include onboard Ethernet, onboard AC97 audio, USB 2.0 support, and an ATA/100 controller. Not exactly exciting, is it? Perhaps with a foothold in the mobile sector, ATI can return with a better desktop solution.

NVIDIA. The official story is that Intel has not granted NVIDIA a P4 BUS license. Hence the 3D graphics specialist is unable

to leverage its success with nForce on the Athlon platform over to the P4. Of course that hasn't stopped VIA. If you ask anyone at NVIDIA, they will tell you that the two companies are best friends and are working well together and that NVIDIA is only interested in focusing on the Athlon XP market, where a lot of work "needs to be done." Whatever the reason for NVIDIA's absence, end users with P4s are missing out.

ALi. Who? Yes, ALi has recently done nothing of sorts and become the butt of many jokes compared to VIA and SiS. The last P4 chipset, the company's ALADDiN-P4, uses M1671, and it supported the older 400MHz FSB P4s. At Fall IDF, ALi did rumble a little regarding a new P4 chipset featuring a new M1681 north bridge and new M1563 south bridge. USB 2.0 and ATA/133 are on the spec sheet, and the pipe link will sport a HyperTransport I/O link. But don't hold your breath. . . .

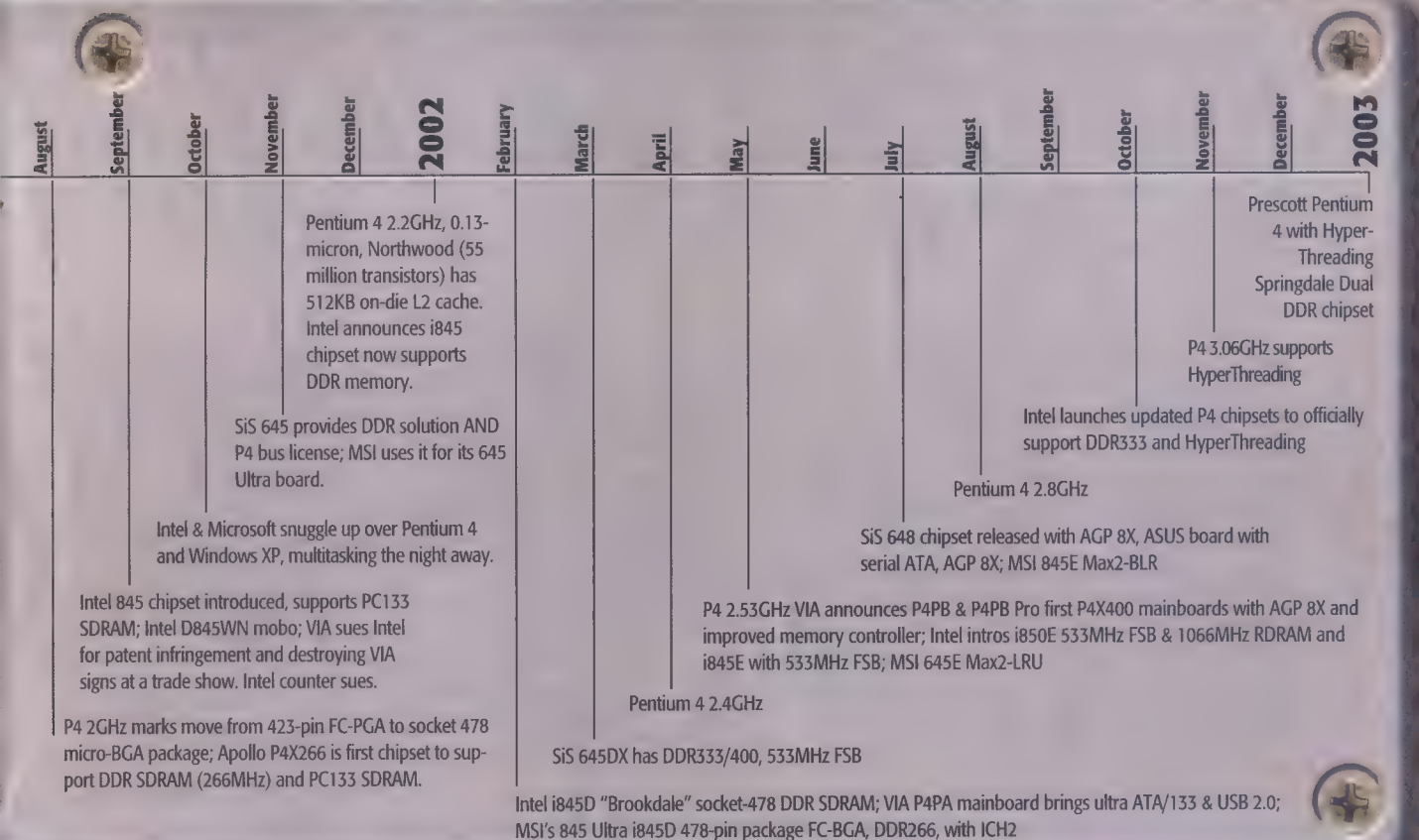
Coming Soon

Combining dual-channel RDRAM support with AGP 8X, internal SiS benchmark

numbers on the R658-based boards (see page 19 of the October *CPU*) are said to be 3% to 5% higher than i850E runs. This would propel SiS up to a new high-end level as yet unattained by the company. Although we reserve judgment until we get our grubby mitts on some samples, we keep an open mind and a hopeful heart. No tier-one OEMs announced as of press time, but mass production is expected by Q4 this year. If Intel drops RDRAM support totally, this could be the only hope of using your sticks.

The P4 3.6GHz with HT support is on its way, which will mean an updated flotilla of Intel chipsets. (See page 21.) Expect official support for DDR333, which will make DDR-based platforms more competitive with SiS and VIA. The i850E will soon get validated for PC1066, as well. The word at this year's IDF is that current i845E/G and i850E chipsets WILL be compatible with HT-enabled P4s with a BIOS update. Happy blasting! **CPU**

by Joan Wood and Alex Ross



AMD MOBOS A Massive Medley

The Athlon XP made major headlines when reviews showed the chip trouncing Intel's Pentium 4 in head-to-head tests. A CPU is only as good as the board it runs on, however. Does the Athlon mobo field stand up to the processor's performance challenge? We surveyed a truckload of Socket A boards to find out.

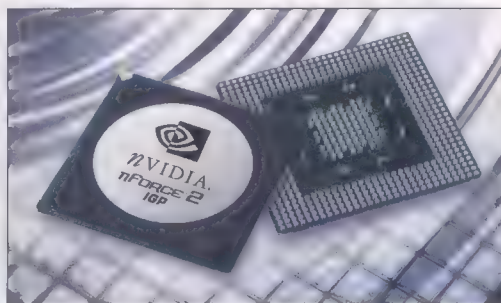
We divided our review units according to chipset. Unlike the Socket 478 side, where Intel maintains a virtual stranglehold on popular chipset designs, there's no de facto ruler in Athlon chipsets. AMD seeded the market with its 750 and 760/761 chipsets, then quietly withdrew to let third parties take over. Of these, VIA Technologies has been the dominant player for years. ALi (Acer Labs) has apparently bowed out from Athlon support, but SiS shows signs of a comeback, NVIDIA is primed for a strong second round with nForce2, and ATI is seeking a foothold.

The board that's best for you depends partly on if you want the latest everything-plus-the-kitchen-sink board or a more value-oriented unit. We looked at price vs. performance vs. features to pick a Top Dog and Best Value mobo for each chipset.

Our Test Bed

We had planned to test with an Athlon XP 2200+ but moved to a 2000+ after discovering the ECS K7S6A isn't approved for or compatible with the 2200+. If you're comparing results here against the P4 numbers from the previous article, keep this in mind. We also used MSI's G4 Ti 4600 graphics adapter (GeForce4 Ti 4600), a

Western Digital 80GB Caviar hard drive, two 256MB sticks of Kingston DDR333 ValueRAM, and, where appropriate, two 256MB sticks of Mushkin PC3200 DDR SDRAM. When incompatibilities were in question, we verified results with Smart Modular DDR333 modules and a VisionTek Ti 4600 adapter.



NVIDIA nForce2

NVIDIA nForce

NVIDIA's first foray into integrated chipsets looked stellar on paper but met with early setbacks when prerelease boards didn't deliver adequate performance. NVIDIA quickly covered with updates that pushed up performance and let boards' qualities shine through.

AMD hit the market first with its HyperTransport technology, delivering 800MBps between the System Platform Processor/Integrated Graphics Processor (essentially the nForce north bridge) and the MCP (Media and Communications Processor [south bridge]). The graphics core (when implemented) is based on the aging GeForce2 MX, which still marks a big leap over preceding integrated graphics chips.

What doesn't get proper airplay is the Dolby Digital encoding built into certain nForce models. This can take any sound stream, even two-channel stereo, and render it into 5.1 Dolby Digital in real-time.

The original nForce spec only accommodates DDR266, but NVIDIA implemented its TwinBank architecture, which uses dual memory controllers to work on memory operations simultaneously—one controller processing while the other prefetches to prevent latency.

The nForce should have owned the value-PC market. Unfortunately, its functionality carried a steep price tag that kept many board makers away.

Top Dog: Leadtek WinFast K7N415DA (nForce 415-D)

The smartest thing NVIDIA did with the nForce was pull the GF2 MX core and enable an external AGP bus. Next was to let users add their own graphics card and keep the nForce's other benefits.

We wish ABIT could have submitted its NV7-133R here because it implements a HighPoint RAID controller the Leadtek's mobo lacks. However, Leadtek's BIOS provides for a non-spec DDR333 mode that we used for testing. In addition to the usual ATX-class ports (including two 9-pin serial connectors), Leadtek bundles a surround sound audio riser. (The nForce MCP chip only supports ATA/100.)

With such a good foundation, the lackluster numbers the board delivered stumped NVIDIA and us. NVIDIA says that with a GeForce4 Ti 4600, 3DMark

Today's Latest IGP's

Paul Ayscough, ATI's head of corporate marketing, says, "One percent of the market plays really high-end 3D games. Five percent . . . plays games with 3D. Ten percent play games in 2D and don't care about graphics, and 85% just don't give a damn. That's where IGP's [integrated graphics processors] end up going—into a lot of low-end machines."

Mercury Research estimates about 60% of today's PCs use integrated graphics parts, and it appears IGP's are on their way to killing off PCI audio and perhaps all but specialized graphics cards. Today's contenders are NVIDIA, ATI, and VIA/S3. NVIDIA's nForce designs lead the pack. None of these platforms may overwhelm you with brute power yet, but this is only the beginning.

ATI IGP 320/FIC AT31 Fusion

After reviewing the Radeon 9700 Pro and previewing the mobile M9, we expected the IGP 320 to follow suit. After all, all three parts are built on a unified pin-out and driver architecture. We knew the 320 uses a Radeon 7000 core meant to compete against the nForce 220. NVIDIA bombed with this part last year because of high pricing. ATI's first 320 incarnation, the FIC AT31 Fusion, lists for only \$99. The Radeon 7000 cost nearly that much only a few months back, so the 320's value seems pretty solid.

The IGP supports an AGP 4X slot option, digital panel output, DDR266, and a TV-Out encoder. ATI provides for compatibility with third-party south bridge chips via the PCI bus, but ATI recommends its own A-Link connection to its IXP 200/250 part. ATI's south bridge features 3Com 10/100 Ethernet, six USB 2.0 ports, AC'97 with SPDIF audio, and ATA/100 drive support.

Because of timing, we only had a roughly 3-hour window to test the AT31. The PCB is trademark ATI red, compact, and a bit crowded. FIC smartly opted for the gouge-free CPU socket orientation, and a translucent silver CPU marks the board's center. There are only three PCI slots and two DIMM slots for a maximum of 2GB of memory.

We did notice a soldered-on wire bridging two tracers. We were told a flaw was discovered in the first 100 or so boards, which went back for quick repair. This

shouldn't be a problem in mass production versions. The BIOS offered no surprises, and the board didn't hiccup once during testing.

That said, we have to discuss the benchmarks. After comparing all our results, we asked ATI to confirm that our numbers were accurate. Despite NVIDIA's claim that we should be seeing 3DMark numbers around 5,000 for the nForce 220, ATI's nearly identical 3DMark results echo ATI's competitive claims. What we didn't expect was the 320 getting crushed in every other test. The low gaming scores don't bother us; nobody buys an IGP board (yet) to play Quake III. What bothers us is the low hard drive bandwidth score, although we should point out that FIC opted for VIA's VT8268B south bridge, and flooding the PCI bus between the chips with benchmark-level traffic may have exposed a weakness in not opting for ATI's A-Link architecture.

ATI says the IGP is designed to be a strong value product, not a benchmark fiend. Users get dual-monitor support, DVD playback, TV output, and excellent image quality. For casual users, the IGP 320 is a great bargain. For those wanting more, ATI says its IGP will move to an M9-class core in the "early or middle part of next year."

NVIDIA nForce 2 (ASUS) Reference Board

Our first brush with the nForce2 set off jarring reminders of prerelease nForce days. NVIDIA sent us a preconfigured Polywell system stocked with DDR266 memory. The PC worked fine, but when we substituted Kingston DDR333 modules and made the appropriate BIOS change, it refused to boot, issuing long beeps until we cleared the BIOS. NVIDIA sent a replacement based on the latest ASUS A7N8X revision. The silicon wasn't set to go "gold" until the week after this writing. This might explain why the replacement system ran DDR333 like a champ but exhibited the identical beeping lockup as the Polywell when we switched to DDR400. (NVIDIA also notes that our Mushkin modules aren't certified for the nForce2 yet.)

Our benchmarks did show that even with DDR333, the nForce2 is a platform worth refining. The board's PCMark and Jedi Knight II scores smashed all competitors. Its

Quake III benchmark was second to SOYO's KT400 product. Remember that this was with all nonintegrated boards running a Ti 4600 vs. the nForce2's own integrated GeForce4 MX core, so kudos to NVIDIA's crossbar memory design. (Specifically, the IGP performs somewhere between its GF4 MX 420 and 440 counterparts.)

(Note: The nForce2 scored a 10,872 in 3DMark after switching to our external Ti 4600 card, placing it second to the ASUS A7V8X in that test. The nForce2 will offer versions without an integrated graphics core.)

Beyond graphics updating, NVIDIA evolved the platform in other ways. On the IGP, the twin-channel memory subsystem jumps from DDR266 to DDR400, and the single-channel, 64-bit low-end option from the first nForce generation is gone. AGP 4X is now AGP 8X. A TV encoder and dual-monitor support, including DVI, composite, and S-Video output, is standard issue.

On the MCP (NVIDIA's south bridge), pay close attention to the nomenclature. The straight-up MCP provides for up to six USB 2.0 ports, Ethernet MAC, two ATA/133 ports, and AC'97 2.1 audio. Clearly, this is a lower-cost implementation designed to make the nForce2 brand more accessible to budget buyers. However, more far-sighted users will want the MCP-T, which adds IEEE-1394a, NVIDIA's audio processing unit, and DualNet. Anyone serious about respectable audio knows AC'97 simply doesn't hack it, and NVIDIA's APU (now promoting the brand name SoundStorm) is a very respectable sound adapter. DualNet's clever, new design integrates two Ethernet controllers, one for a broadband modem and the other for a LAN interface, effectively turning the board into a residential gateway.

What will this cost? NVIDIA says it understands the nForce2 needs to hit retail shelves for under \$100 (presumably with the vanilla MCP). As no production boards were available at this writing, firm numbers aren't available, but NVIDIA hopes vendors will keep costs down by not adding such features as Serial ATA and unnecessary PCI slots. If everything goes to plan (and bugs are worked out), this may become the platform of choice heading into Q4. ▲

scores should be well above 10,000 and Jedi Knight II numbers around 200. After installing the Detonator 40.41 drivers (now in beta), 3DMark crashed about halfway through testing. The 415's TwinBank, 128-bit memory architecture only works if both DIMMs are situated in the proper slots. The Leadtek manual doesn't mention how to properly configure the board, and switching from slots 1 and 2 to 2 and 3 appeared to make no difference, anyway.

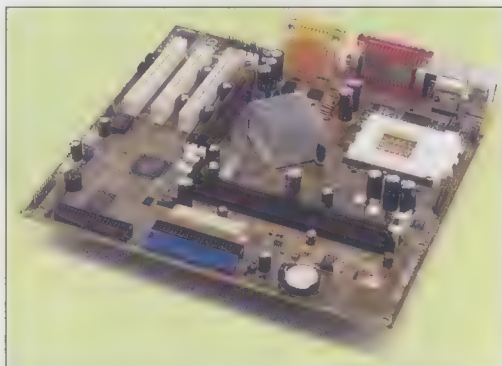
The board scored the highest PCMark HDD numbers and second highest Memory numbers of any board tested. Non-gamers who can find this nForce at a good price may want to jump on it.

**Best Value: ASUS A7N266-VM
(nForce 220-D)**

If you're on a budget but want fair graphics functionality, the nForce 220-D is a fine chip. It forsakes TwinBank for a more mainstream 64-bit memory architecture, a fact our oddball benchmark results sometimes reflect and sometimes don't.

ATI supplied this board in a fully configured system for benchmarking against its IGP 320 product. Our results reflect

using 256MB of DDR266 memory and an Athlon XP 2200+ chip, which likely explains the high CPU score in PCMark. The low graphics numbers reflect the 220-D's value-market approach, which includes swiping 32MB of video memory from system RAM. Remember, this board



ASUS A7N266-VM

probably isn't going to show up at DOOM III fragfests.

The micro-ATX board comes with three PCI and two DIMM slots and an AGP 2.0 slot. It has an intelligent design, so if your screwdriver slips during heatsink installation, you'll likely gouge the table and not the transistors governing your DIMM slots.

Standard LAN and USB 1.1 ports are present, and ASUS throws in PC-cillin 2000, Cyberlink's PowerPlayer SE, and more.

SiS 745

The SiS 746 wasn't shipping at press time, so we reviewed the SiS 745. The 746 will feature such emerging features as AGP 8X, USB 2.0, and ATA/133. The 745 foregoes these for AGP 4X, up to six USB 1.1 ports, and ATA/100. The 745 offers neither LAN nor HPNA; the 746 will offer integrators this choice.

Interestingly, the SiS 745 integrates the north and south bridges onto one chip. No doubt this has to do with some of the limited south bridge functionality, but it also helps drive down board costs. SiS squeezes in DDR333 and IEEE-1394a support, helping lift the 745 above other mainstream competitors. Unfortunately, none of our review boards use the FireWire option.

Another advantage of the 745's integration is its 1.2GBps north-south bridge connection, a proprietary link called MuTIO. PCMark HDD scores show the 745 defeats even VIA's KT400 on drive throughput, barely finishing behind the nForce family. The chip's memory handling falls behind

How Our Mobos Match Up

This chart details the benchmark scores of our Top Dog and Best Value motherboard winners. For benchmark scores of each motherboard we reviewed, see our chart at www.smartcomputing.com/cpumag/nov02/amdmobos.

Chipset	Motherboard	Comanche 4 (fps)	Jedi Knight II (fps)	Quake III Arena (fps)	PCMark 2002 (CPU:Memory)
NVIDIA nForce 220-D	ASUS A7N266-VM	16.81	54.2	84	5,331:2,911
NVIDIA nForce 415-D	Leadtek K7N415DA	33.63	39.6	97.2	5,041:3,595
SiS 745	AOpen AK75	36.93	91.5	212.1	4,875:2,659
	ECS K7S6A	36.78	91.5	210.5	4,964:2,714
VIA KT333	AOpen AK77-333	38.16	95.6	221	4,939:2,964
	MSI KT3 Ultra2-BR	37.67	93.8	218.8	4,894:2,999
VIA KT400	ASUS A7V8X	39.46	85.1	217.8	5,031:3,476
	SOYO KT400 DRAGON ULTRA	39.41	100.1	233.2	5,004:3,120

Memory Matters

Although DDR266 is still the dominant memory format today, upgraders are pondering one question: DDR333 or DDR400? The answer is... a mess. Memory vendors not currently selling DDR400 modules maintain that the vast majority of so-called DDR400 is actually overclocked DDR333, which also carries its own stability concerns.

For some additional weirdness, check out our DDR333 vs. DDR400 numbers on the Asus A7V8X board:

- **DDR333.** Comanche 4: 39.46 average fps; 3DMark: 11,180; Quake III Arena: 217.8fps; Jedi Knight II: 85.1fps; PCMark, CPU: 5,031, Memory: 3,476
- **DDR400.** Comanche 4: 38.86 average fps; 3DMark: 10,921; Quake III Arena: 209.2fps; Jedi Knight II: 82.4fps; PCMark, CPU: 5,051, Memory: 3,471

That's right. Numbers that lean on memory usage actually dropped. In addition, the

same phenomenon appears on other KT400 boards, too.

When asked for an explanation, a Mushkin rep stated that the memory's raw bandwidth was swamping the Athlon's FSB capabilities, filling buffers and inducing additional latency.

In theory—theory, mind you—this could result in as much as 5% lower performance. AMD's PR is neither agreeing or disagreeing with this, but states that in times past when memory frequencies sped

past the CPU bus, tests still managed to show overall system benefit despite the asynchronous conditions.

VIA has recently taken DDR400 off of its roadmap and may wait until DDR2 appears in 2003/2004 before moving forward. SiS has followed suit. NVIDIA may turn out to be the only big DDR400 supporter by year's end, but it will surely run an extremely tight certification and validation program if it does so. ▲

the pack, and the 745 scores squarely in the middle for graphics. The SiS 745 isn't our first choice, but it delivers the goods and gave us no problems in any configuration.

Top Dog: AOpen AK75

Because our SiS 745 boards offered practically identical features (down to the CNR

slots and resettable fuses behind the PS/2 ports) for under \$80 (street), we had little on which to pick our winners, save performance scores and a few minor features.

With a black PCB and large, black capacitors, the AK75 is slightly more high-tech-looking than its rivals, but its white text screening gives it a cluttered appearance. The larger caps near the DIMM sockets give some reassurance (purely unfounded) that the board will perform better with higher-speed memory.

Speed is the AK75's one true advantage over other SiS 745 boards. AOpen uses a jumper to default the board to a 100MHz CPU bus, but the BIOS provides for overclocking the chip up to 166MHz. There's also an integrated SPDIF connector (the backplane SPDIF module isn't included) and a Windows-based BIOS flashing utility. Based on the chipset's top benchmarks in our test games and the best PCMark HDD score, AOpen gets our nod.

Best Value: ECS K7S6A

The ECS K7S6A is a clean but bland board. The manual alludes to installing apps under Win98 and shows a screen shot of installing VIA drivers, but at least the board comes with a paper manual, unlike AOpen's irksome PDF version.

The K7S6A also defaults to a jumperless configuration out of the box, making life

easier on newbies. Like all SiS 745 boards, the K7S6A supports up to 3GB of DDR266 but only 2GB of DDR333, not that anyone is likely to exceed these amounts on a current mainstream mobo. The board lacks AOpen's small audio and overclocking refinements, instead seeking to make amends with PC-cillin 2000, PCDJ, CD Ghost, and other apps.

Overall, this is a simple board for ordinary users that pulled in the best Memory and 3DMark scores of any SiS 745 board.

VIA KT333

Following the huge success of its KT266A chipset, VIA's KT333 adds another 25% of additional memory bandwidth by supporting DDR333 while preserving the AGP 4X graphics interface. Unlike the SiS 745, the KT333 can easily run 3GB of DDR333, although the chipset is capable of 4GB.

On the VT8233A south bridge, the specs include legacy support, ATA/133, six USB ports, and the latest AC'97 audio/modem codec. There's not much to write home about, but not much to complain about, either. Connecting the two chips is VIA's 266MBps V-Link, preserved from the KT266A, which bypasses the PCI bus for higher efficiency.

VIA didn't integrate a LAN controller in its south bridge, and USB 2.0 was still in

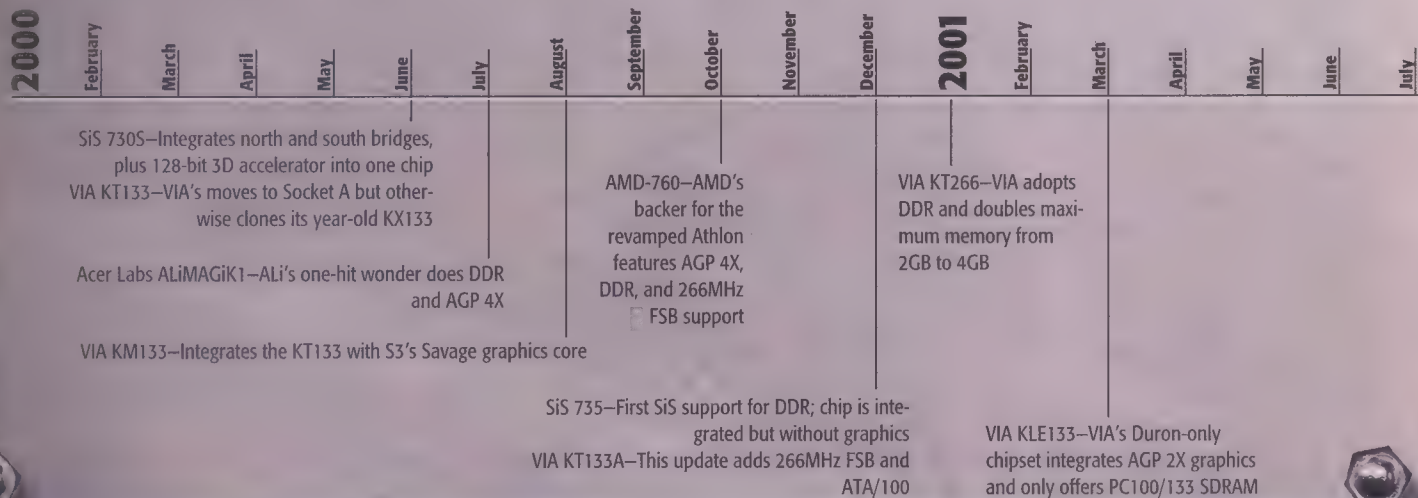
3DMark 2001 SE (Marks)

Category

1,665	Best Value
5,244	Top Dog
9,757	Top Dog
9,956	Best Value
10,138	Best Value
10,271	Top Dog
11,180	Top Dog
10,364	Best Value

Athlon/Duron Chipset Timeline

The following timeline details a number of the more significant events, features, and evolutions of the Athlon and Duron chipsets throughout the last three years.



the works when the chipset debuted. VIA maintains FireWire is a minor feature most users aren't requesting, which is why VIA continues to omit the function.

The chipset's shining strength is its superb memory handling, a key factor in its strong gaming benchmark scores. KT333 boards all performed well out of the box and derived only a slight benefit from installing the latest VIA 4in1 drivers.

Top Dog: MSI KT3 Ultra2-BR

MSI is known for delivering solid boards with many extra features. The KT3 Ultra2 follows suit on its latest KT333 flagship by integrating dual-channel Promise RAID and an add-on that's currently unique among mobo vendors: Bluetooth. The board ships with a tiny riser card that cables into a PCB-mounted pin connector. An external antenna connects to the riser, but the antenna's cable is only about two feet long, so you may not get clear of interference sources. MSI adds a USB-based Bluetooth transceiving key that you can plug into another PC so your MSI board has another machine to communicate with. Riser cards for USB 2.0, SPDIF, and surround analog jacks are also included.

The board does have bulky caps strewn everywhere and locations where space was

made for chips that weren't implemented, but the feature placement is impeccable.

You will find weirdisms in MSI's design. For example, you can only use two drives in a RAID, despite two ATA/133 RAID connectors being present. Making amends is MSI's overclocking tools or the Avance audio driver that sets the chipset's AC'97 audio virtually on par with a Sound Blaster. The KT3 installs quickly, has good documentation, and only required one manual adjustment: switching the core CPU frequency from 100MHz to 133MHz. The board's benchmarks were very close to unseating AOpen as the best-performing KT333. MSI also has one of the best mobo tech-support programs—online and off.

Best Value: AOpen AK77-333

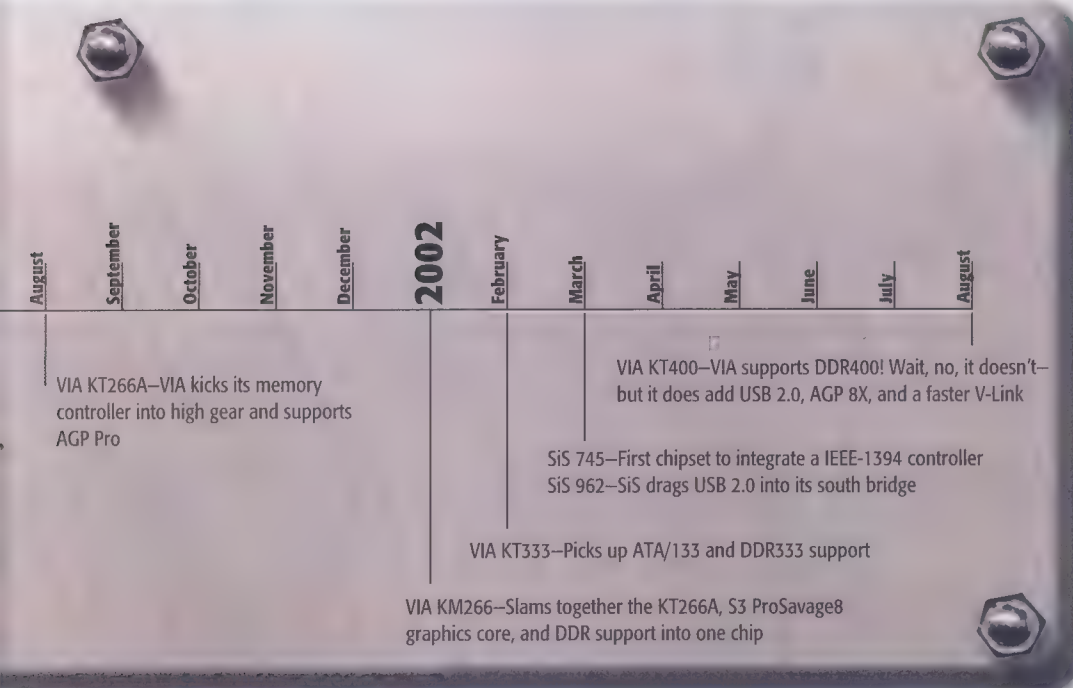
Plant a Corvette engine in a Toyota Celica body and you'll get a sense for the AOpen's AK77-333 value. There are no frills here, not even the optional eight-LED diagnostic display. There is a backup "rescue ROM" if the first BIOS chip is damaged by a virus, but the second chip isn't provided. AOpen includes USB 2.0 ports on a backplane adapter, a largely extraneous heatsink fan for the north bridge, and a charming yellow label by the CPU socket reading: "Warning: Components below this label. Be careful to install CPU fan."

The board's look reflects the equivalent of a PCB bad-hair day, but the AK77-333 is all about performance. It roars out of the gate, screaming its way to the top of our test results. The BIOS accommodates 1MHz-frequency stepping and includes a strong hardware monitoring app. Perhaps because there's little on the AK77-333 that can go wrong, our tests ran smoothly. We'd happily recommend this board to anyone wanting a performance board on a low-end budget.

VIA KT400

Where the KT333 was a quiet bump up from the KT266A, the KT400 takes bold strides forward. First, the chipset's block diagram shows that the memory bus only specs up to 333MHz. This is VIA's way of coping with the lack of an official industry DDR400 spec. If mobo vendors want to support and/or certify any given DDR400 modules, the chipset is amply capable of running at those speeds. The chipset can handle up to 4GB of memory, although most vendors only provide three slots. The AGP bus is updated to version 3.0 (8X), although ATI's Radeon 9700 Pro is the only 8X card out as of this writing.

VIA's V-Link doubled in bandwidth to 533MBps, although evidence of this is hard to find in our PCMark results. On the VT8235 south bridge, VIA makes some



necessary upgrades. Although Serial ATA is still absent (look for it in Q4), the KT400 steps up to six USB 2.0 ports and a native 10/100 Ethernet controller. In Q1 of 2003, expect 802.11b to be added to the list.

Given the dearth of compliant cards, we can't get too excited about AGP 3.0 yet. As we saw with the SOYO board, manufacturers have some kinks to work out. Additionally, the need for DDR400 modules on the Athlon XP platform is still highly questionable. Should you grab a KT400 board today? If a roughly 5% hop in gaming speeds sounds good, go ahead. Otherwise, your decision should probably revolve around add-on features such as Serial ATA and Gigabit Ethernet. If you don't need these, a better KT333 board may offer better bang for your buck.

Top Dog: ASUS A7V8X

This muthah of mobos goes all out to handle every possible performance user's need. The board is clean and efficiently arranged considering its avalanche of third-party features. We appreciate little touches, such as the omission of a chipset fan to reduce power consumption and noise. We wish the CPU socket clip were at the board's edge, but ASUS does reinforce the PCB below each side of the socket.

The A7V8X features read like a who's who list: AGP 8X, Serial ATA, DDR400, Broadcom Gigabit LAN, USB 2.0,

IEEE-1394a, and single-channel Promise RAID (0/1). Short of integrating wireless networking à la MSI, we can't think of anything else ASUS could have included.

Extras worth noting include Q-fan, which dynamically adjusts fan speeds based on system load, and a Windows-based BIOS flash utility. In addition, the BIOS supports multiple languages. A respectable antivirus app would've been nice, but ASUS includes InterVideo's excellent WinCinema bundle, which includes WinDVD.

The board took an unexpected dip on Jedi Knight II but nailed the often-problematic 3DMark tests, capturing the highest score of any board we reviewed. It also excelled on memory performance, even when just using DDR333. For power and expandability, your search is over.

Best Value: SOYO KT400 DRAGON ULTRA

If we had an award for Sexiest Mobo, the KT400 DRAGON ULTRA would win. Its platinum-colored PCB, black screening, purple PCI slots, and well-organized silver caps belong in any mod case with a Plexiglass window. It only slips on two small points: The ATX power connector is behind the connector ports rather than between the DIMM slots and IDE connectors. We had to carefully tie our power cables so they didn't interfere with the CPU fan. SOYO also puts a row of transistors

between the first DIMM slot and the CPU socket clip—a recipe for impalement disaster.

The SOYO's Quake III scores capped all comers and placed second in Jedi Knight II and Comanche 4. The PCMark numbers are respectable but no match for the nForce2. Now for some good and bad news: We obtained the SOYO's numbers by running just in Normal Mode but after installing the VIA 4in1 drivers, the board consistently crashed in Fast and Turbo modes.

Although not quite the black hole for board-mounted features that the ASUS KT400 is, SOYO holds its own with dual-

channel Promise RAID, 10/100 Ethernet, six USB 2.0 ports, and a C-Media audio chip that feeds into a SPDIF (including optical in and out) backplane card. The shining star in SOYO's extras package is its BayOne adapter, which mounts into a 5.25-inch or 3.5-inch chassis bay and features two USB 2.0 ports, plus CompactFlash and SmartMedia slots. You get great overclocking options in the BIOS; Norton AntiVirus 2002, Ghost 2002, and WinDVD; and maybe the best documentation of any board here. If you can live without integrated Serial ATA and FireWire, this board is nearly irresistible.

Peace Of Mind

Six months ago, we probably would have held off on mobo upgrading. There were too many new standards and features on the horizon to risk dumping \$150 on something that would be painfully outdated by Christmas. Today, we're confident this latest crop of Athlon boards has a lot of mileage remaining in it. Athlon boards now should leave you sitting pretty for at least a year and maybe two. In short, this is the best time in a long time we've seen for upgrading. Make the best of it. **cpu**

by William Van Winkle

(To read all our AMD motherboard reviews, go to www.smartcomputing.com/cpumag/nov02/amdmobos.)

The Bleeding Edge Of Software

by Warren Ernst

Inside The World Of Betas



Official product name: Sonique2
Version # previewed: Alpha build 08.28.2002
Publisher: Team Sonique
Developer and URL: Team Sonique; sonique.lycos.com
ETA: Q4 2002
Why you should care: A nice skinnable player that isn't Winamp.

Fortune-telling becomes an exact science when it comes to working with betas. This month we bring you four glimpses into the future of software.

Sonique Alpha 2.1

Sonique is among the better known alternatives to Winamp. The long-anticipated version 2 is a step closer to reality with the first public alpha, which adds several features.

The big news is the Mantis engine; it acts as a new programming methodology for writers of Sonique skins. The system uses a simpler XML-based language and graphics file set to make it easier for nonprogrammers to make skins. Mantis builds on Sonique's already fantastic skin scheme, far surpassing Winamp 2.x's. Sonique can look like anything from a crescent-shaped dumbbell to a full-screen MP3 kiosk. The new GUI scheme can drag on CPUs in slower machines; some responses take *seconds*. However, there's no appreciable delay on about 400MHz systems or above.

The playback engine does perform well on slow systems, with none of Winamp's pops and crackles as the hard drive gets hit. With a system hooked up to a nice stereo amplifier and speakers, playback is slightly better than Winamp, but Sonique comes with a signal processor that's an extra with Winamp. If standard PC speakers are your primary sound output, you probably won't notice the difference.

Sonique also records streaming audio to a hard drive. There's no direct support for portable MP3 players, but you can copy a saved MP3 and listen. When Sonique is the default player, double-clicking an MP3 doesn't reset the playlist. The developers say there will always be a free Sonique version, but it's worth the download even before final release.

Smart Bomb PC Shutdown 1.0.1.7 Beta

You like your PC crunching through video processing or downloads during the night. You also want it to shut down or hibernate when finished. Many auto-shutdown apps are available, but most don't know when your PC is done computing.

Smart Bomb PC Shutdown does, and it works well. It has two sensors: One monitors CPU usage, one Internet throughput. SBPCS starts monitoring the sensors once the countdown timer runs out; you must set it up. Ordinarily, you'd start your

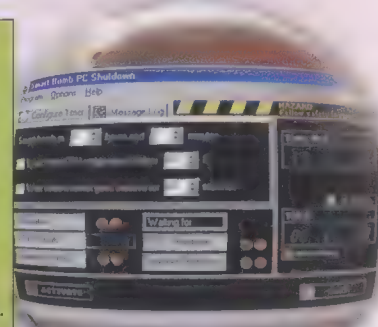
download or processing job to run into the night and set SBPCS' timer for when you think the job will finish. When the timer stops, SBPCS checks for an idle CPU or no Internet connection. If this is the case, the shutdown routine runs.

Shutdown options are many. There's a normal and forced shutdown, which closes any uncooperative apps. The app won't save open files, though. There's also hibernation options, with or without power to the RAM.

SBPCS has many smart options. Perhaps best is the CPU threshold setting because some systems idle out at 2% CPU usage but others with many background tasks may idle out

at close to 40%. This takes some testing, but it works well. The authors don't sell freeware, so expect a fee for the app eventually, and calculate SBPCS' value accordingly.

Official product name: Smart Bomb PC Shutdown
Version # previewed: 1.0.1.7 Beta
Publisher: Moon 1000
Developer and URL: Moon 1000; www.moon1000.com
ETA: Q4 2002
Why you should care: Let your PC run at night and save wear and tear.



AtClock 1.0 BETA b.71

You might not think that there's much to say about that little clock in the System Tray in Windows, but maybe that's because you're used to it doing essentially nothing. OK, it keeps time (not always necessarily accurately), but it certainly looks plain.

AtClock is a "super-duper taskbar clock" with a few tricks up its sleeve. First, it's completely skinnable, able to change font, font size, font color, immediate background color, and shadow and fading effects. This may not seem a big deal, but if you use an alternative window manager or tricked-out XP theme, AtClock may be the finishing touch you're shooting for.

As a clock, AtClock displays more information than the default clock. It optionally adds the month, day, date, and seconds to the System Tray, and if you're really interested in a different look, a blinking colon. You can even alter the rate at which it blinks.

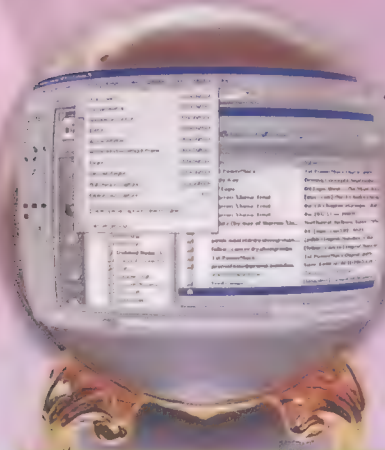
AtClock can also automatically sync itself to an atomic clock, either when it detects a network connection, at a specific time of day, or on command. AtClock provides an extensive list of public-time servers, or you can enter a new one yourself.

For managing your time, the standard Windows clock is essentially useless as a planner, but AtClock helps in two ways. First, positioning your mouse pointer over AtClock displays a calendar showing the current month. However, you frustratingly can't skip ahead or go back a month. Second, you can easily add alarms with a few mouse clicks that will pop up a window and ring a chime or whatever WAV file you want.

Is this functionality worth \$20? That's hard to say. Fortunately, the beta works for a month without nag screens, giving you time to decide for yourself.



Official product name: AtClock
Version # previewed: 1.0 BETA b.71
(b.74 was recently made available)
Publisher: AIRONS Software
Developer and URL: AIRONS Software;
www.atclock.com
ETA: Q3 2002
Why you should care: A nifty little widget to spice up your screen and schedule.



Official product name: HyperSnap DX
Version # previewed: 5.00.00 beta 1
Publisher: Hyperionics
Developer and URL: Hyperionics;
www.hypersnap-dx.com
ETA: Q4 2002
Why you should care: This is the best screen-capture utility ever created.

HyperSnap DX 5.00.00 beta 1

What could be simpler than taking a screen shot? Just press the Print Screen key, right? Well, no, that isn't all there is to it. You need to paste the image into a graphics program and edit it. A lot of users use Paint or Photoshop, but either way, the tools these programs provide aren't really designed with screen captures in mind. And what about those screens you can't seem to capture?

HyperSnap has been the grand poobah of screen capture tools for many years, but its interface left something to be desired, and it lacked truly useful editing tools. The latest beta takes a stab at these problems. The result is the best capture tool ever created in terms of flexibility and power.

Have you tried taking a screen shot of a Direct3D, Glide, or OpenGL game and gotten your desktop, a screen full of gibberish, or simply nothing at all? How about a screen shot of a

paused DVD in your software DVD player? Do you get either an empty screen or a blue overlay? In these situations, nothing beats HyperSnap because it knows how to grab these screens.

Even normal screen captures are easier because of all the built-in cropping options. HyperSnap can grab the entire screen, active window, active window without its border, an individual button within a program, or a user-defined region. It can also grab a sequence of screens, via either a timer or user-defined key press. If you regularly document procedures that require many screen shots, not having to crop 10 captures is a huge time saver. And because all the tools you'll ever need to alter a screen shot are there, there's no need to save the files, open them elsewhere, and save them again.

The beta is extremely stable and polished, and it will almost certainly spoil you to other capture programs. You have been warned.

Send Us Your Betas

Know of software in the beta stage that's deserving of some attention? Let us know. We'll take a look at it and possibly give it a go-around. Send your prospects to bleedingedge@cpumag.com.

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Do It, Dig It, DVD It

DVD Authoring Isn't All That Scary

If you don't already own a rewriteable DVD drive, this is the holiday season that could change all that. We're not saying your tech stocks portfolio will magically return to its dot-com heyday glory. Still, we will bet that DVD drives' falling prices and increasing recording speeds are feeding your desire to own the latest and greatest in optical storage.

High prices have been just one of the factors keeping rewriteable DVD drives from becoming mainstream, and it's arguably not even the main factor. Multiple, incompatible DVD standards confused a lot of potential buyers, novices and power users alike. However, Sony's new DRU-500A (\$350) made headlines in September by being the first drive to support both DVD-RW and DVD+RW. Drives such as Panasonic's DVDBurner II already support both DVD-R/RW and DVD-RAM, so a drive that supports all three formats could conceivably appear before you read this article. In addition, most new DVD-RW and DVD+RW drives also burn CD-R/RWs. In other words, you're running out of excuses not to buy a drive.

Of course, a rewriteable DVD drive is only as much fun to use as its software, and you may not be completely happy with the bundle packaged with the drive you buy. Fortunately, each DVD-authoring title I reviewed for this article was not only easy to use, but also more or less complete for most home and small business needs. Each was compatible with Windows XP and both DVD-RW and DVD+RW drives, including the Johnny-come-lately, write-once DVD+R format.

How We Tested

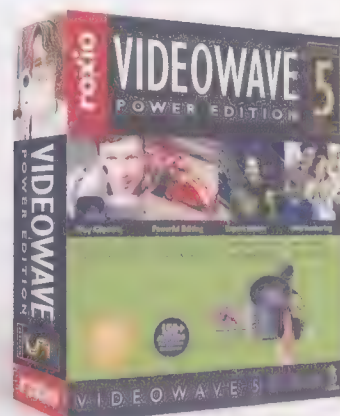
To begin testing these apps, I first nabbed a sweet Memorex 2.4X/2.4X/8X DVD+RW from our hardware testing labs. Next, I installed the drive and software

in a PC with an Athlon XP 1700+, 256MB of PC2700 DDR-SDRAM, an ASUS A7V333 motherboard, WinXP Pro, and 100GB of storage space on two Seagate hard drives. I tested each application for function and ease of use.

I chose to review DVD-authoring applications with video-editing capabilities rather than straight data-burning apps like those bundled with CD-RW drives. I decided this because video takes greater advantage of the various DVD formats' potential than does common data. "DVD-authoring" means transferring video to one or more types of optical disc and adding at least one menu. The basic gist of video editing is that you choose video scenes and audio clips stored on your hard drive and assemble a storyboard that represents the flow of the program you wish to transfer to DVD or videotape. In most editing utilities, you can trim segments from video and audio clips and apply special effects, such as making the footage black-and-white or slow motion.

Roxio VideoWave 5.1 Power Edition

Roxio's Easy CD Creator is perhaps the biggest name in CD burning on the PC platform, with only Nero Burning ROM developer Ahead Software commanding similar user loyalty. Roxio took the same friendly, kitchen-sink approach to its video-editing and DVD-authoring software, VideoWave. Roxio's Power Edition has two extra CDs of royalty-free design elements, such as audio clips and graphics that you can add to your productions. It also brings more flexibility to your creative process with more special effects. It runs under Win98SE/2000/Me/XP and supported my DVD+RW drive very well.



VideoWave 5.1 Power Edition

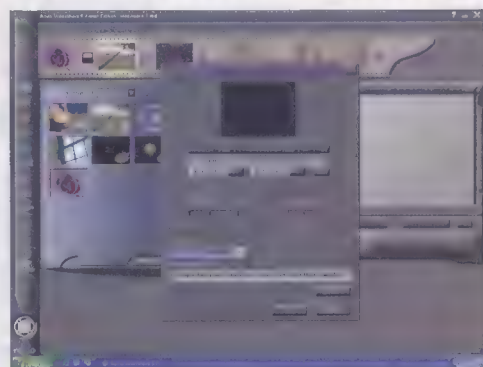
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VideoWave 5.1 can make DVDs, Mini-DVDs, and VCDs. It can capture analog video, assuming you have a video capture card, and also DV (digital video) through a FireWire port, also assuming you have a DV or Digital 8 camcorder. The latter method lets you control your DV camera directly from VideoWave. The app also can encode your video directly to MPEG-2 and automatically

split it into more manageable scenes based upon changes in the footage.

VideoWave lets you save still images out of video clips as JPEGs or other files, which lets you make personalized menu buttons for specific chapters later on. You can add and edit a wide range of transitions and create fast- or slow-motion scenes. You'll also have up to six audio tracks to play with. VideoWave PE will let you remove a foreground color (traditionally blue or green) and insert other video, just like the over-the-shoulder newscasting trick known as chroma key.

If all these editing features sound daunting, check out VideoWave's templates for storyboards, scene selection menus, and other things. Roxio also provides a very nice 90-page users guide with screen shots, which goes a long way toward answering the how and why of your questions. The guide even devotes about 20 pages to the terminology and techniques of shooting video.

I found VideoWave PE's editing interface to be very simple and intuitive with reasonable drag-and-drop functionality. The program captured 720 x 480 MPEG-2 video from a VCR without a single dropped frame.

I created a simple video storyboard with a few customized transitions. Next, I clicked Produce to save my creation as a movie file. I had a nice choice of MPEG-1, MPEG-2, AVI, WMV, and Real formats, in addition to NTSC and PAL video standards and various resolutions within them. Finally, I created a menu using VideoWave's sample buttons and the button "align to grid" straightening feature, broke my video into chapters, and previewed it all before I burned it to DVD+RW. The disc played back fine on my Pioneer DVD-ROM drive. On a separate project, though, VideoWave could only burn my MPEG-2 videos to DVD+RW with stuttering audio, even after formatting the disc.

Roxio VideoWave 5.1 Power Edition can't burn SVCDs like DVD Workshop, nor can it capture to and edit on DVD like MyDVD. The app also lacks a slideshow feature. Still, it was easy to

learn and made one flawless DVD out of two. New users may also find that the Power Edition's extensive library of design elements can save lots of time in trying to create their own. Unless you actually need the features VideoWave PE doesn't have, don't rule it out.

Sonic Solutions MyDVD Video Suite 4.0

MyDVD is a familiar fixture in the software bundles that come with rewriteable DVD drives. It doesn't include a video-editing component, though, so Sonic Solutions added ArcSoft's ShowBiz 1.2 editor to it and called it MyDVD Video Suite 4.0. It may give new users the easiest method to make hassle-free DVDs, but I would like to see a few glitches resolved in the resulting discs that are created.

Before I dive into some of MyDVD 4.0's innovations, I'll give you some of its vital statistics. The program can capture video and encode it directly to MPEG-1



MyDVD Video Suite 4.0

\$99

Sonic Solutions
(888) 766-4248
www.sonic.com



and MPEG-2. The app also can import AVI and QuickTime video files, plus MP3, WAV, and MPA audio files. You only can create DVDs and VCDs with MyDVD 4.0, although you can make the latter with interactive menus (VCD 2.0).

Mark Ely, general manager of Sonic's desktop products group, says the company dropped Mini-DVD and SVCD support in version 4.0 because of compatibility issues with common players. The suite does support DVD+R and Win98/98SE/Me/2000/XP.

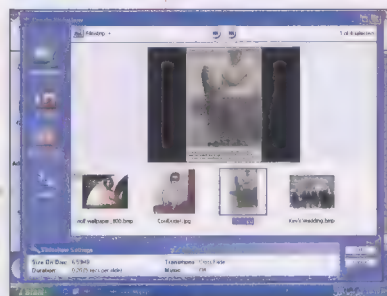
Ely says Sonic aimed to give users a fast way to back up their videotape libraries on DVD, especially when they don't feel the need to do any editing or rearranging of the content.

MyDVD's Direct-To-DVD feature writes the video it's capturing directly to DVD, once you've chosen a menu style. It will automatically create chapter points at time intervals you set, but you can also hit your Spacebar during capturing to set chapters on your own.

Ely says future versions may automatically set chapters at the beginnings of new scenes. MyDVD's Edit-On-DVD feature simply lets users use DVD+RW for storage during authoring instead of the hard drive. Edit-On-DVD only works on DVD+RW at the moment, but Ely says it also will support DVD-RW soon.

MyDVD's other major innovation is called OpenDVD. This feature lets you open an existing DVD or VCD as a project you can edit, as long as you created that disc using MyDVD. This means that even after you've burned a video project to disc, you can go back and add or delete footage, change menu graphics, edit text captions, and so forth. You then can burn the edited project to another disc or to the

same DVD if it is rewriteable. Note that OpenDVD uses the disc's finished video as source files, which means that any segments you trimmed out before burning will not be available to



edit later.

Like Ulead DVD Workshop, MyDVD lets you make slideshows with music soundtracks and transitions. Unlike its rival, however, MyDVD can store your

original image files in a separate folder on your disc, so you can offload or print better quality versions of the images you used in the slideshow. MyDVD only can use existing image files stored somewhere on your PC for slideshows, but you can use ShowBiz to lift still images from your video clips.

Editing and authoring a DVD with this suite was fast and enjoyable. MyDVD made it easy for me to create motion menus and buttons out of my own still images and video clips. It also has several theme templates to help document a wedding or create a high-tech baby book.

Photoshop users can use MyDVD's plug-in to design elements in that program and then export the elements back to MyDVD. Meanwhile, ShowBiz has a good selection of dissolves, wipes, and other transitions, plus the usual color and brightness adjustments. It limits you to just two audio tracks, though. I would have preferred more freedom to layer songs and narration over my clips' natural sound.

I made a colorful DVD project with a motion menu and buttons, incorporating one video title and a slideshow that I composed of JPEGs and BMPs. MyDVD let me render my motion menu so I could preview it before I burned everything to DVD+RW. Ely claims that Sonic's intimate work with the DVD Forum the last six or seven years ensures that MyDVD discs have a higher rate of compatibility with consumer DVD players, which is something to consider.

I found MyDVD easy to use, if a little light on settings. However, I had to locate a motion menu background file for it during its preparation for the burn process. The DVD+RW I made played back fine under PowerDVD on my Memorex drive, but the crossfade transitions between the slides in my slideshow weren't very smooth. Neither was the looping of my motion menu nor the transition from my video to my slideshow. Both had amateurish audio glitches.

In short, MyDVD is a joy to use and a paragon of innovation. On the other

hand, the program definitely could use a little bit of refinement.

Ulead DVD Workshop 1.2

DVD Workshop 1.2 from Ulead is a pretty impressive piece of work. It combines video-capture and editing functions with DVD authoring and adds some extras to sate control freaks. It doesn't have a large, consumer-style library of stock footage and audio, but it's simple enough for beginners to use after a bit of accustomation.



DVD Workshop 1.2

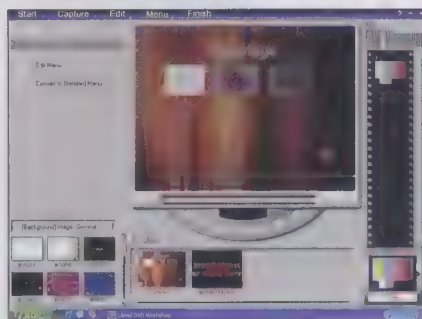
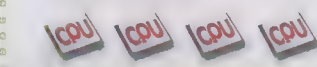
\$279 download; \$299 boxed

Ulead

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(310) 896-6396

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DVD Workshop can capture analog video through your video capture card or DV through your FireWire port. The program can also convert the video it captures on the fly to MPEG-1 and MPEG-2. In addition, it supports

imported QuickTime and AVI files. It also can split captured AVI video files into scenes automatically.

DVD Workshop runs under Win98/98SE/Me/2000/XP, and it can create DVDs, Mini-DVDs, VCDs (Video CD), and SVCDs (Super Video CD). Mini-DVD is probably better described by its other name, DVD-on-CD. Mini-DVD uses MPEG-2 compression, as does SVCD. VCD uses MPEG-1 compression, and it has less quality. VCDs and SVCDs can play on most regular DVD players, but Mini-DVDs may not play on many devices.

Version 1.2 of DVD Workshop adds DVD+R support and speed improvements, plus the ability to change the aspect ratio and bit rates of MPEG files. It also features Ulead's MPEG.Now codec, which encodes using a VBR (variable bit rate) technique to increase video quality during periods of motion and to keep the file size low during relatively static scenes. As in the MP3 audio realm, however, you may find that your playback hardware (especially VCD players) may not support VBR codecs. Most DVD and SVCD players shouldn't have any trouble, though, as the MPEG-2 compression they use includes a VBR component already.

DVD Workshop's storyboard editing process took me perhaps 60 seconds longer to figure out than Roxio's VideoWave Power Edition 5.1's process. Once I understood what DVD Workshop wanted from me, I found the app to be exceptionally straightforward. If you've never done video editing on a computer, expect to spend some time reading through the manual, which was in PDF format in our downloaded version (\$279).

I assembled a project with various video clips and explored many of the features on DVD Workshop's bragging list. For example, you can set the "after play" characteristics of a video clip to automatically segue into the next clip or go back to a menu.

I liked DVD Workshop's templates and wizards that helped me design a

menu that a viewer could navigate with the DVD player's remote. The templates didn't lock me in, either; I could change them around a bit.

Of course, I also could have built a menu from a blank page, but I settled for adding an MP3 soundtrack to my template. The big news here is DVD Workshop's motion menus, which you can design with animated backgrounds and buttons. These take up more space on your finished disc, but they can add some punch to your project. DVD Workshop also can pull still images out of video clips. You can assemble these images with specific on-screen durations to make musical slideshow presentations, too.

I used DVD Workshop's simulated DVD playback control to try out my production. Everything worked correctly, so then I burned the project to DVD+RW. The software played it back on my 2000-vintage Pioneer DVD-ROM drive without any trouble.

DVD Workshop also made a flawless disc of a separate project, one that Roxio's VideoWave Power Edition 5.1 consistently burned with choppy audio. Ulead threw in a few playability settings you can enable in DVD Workshop, such as VCD-player compliance and an antiflicker filter for better playback on

some television screens, but I didn't need to mess with them.

DVD Workshop's ease of use seems incongruous in a \$279 DVD-authoring app with businesslike features and great tweakability, but I'm not complaining. I'm left wondering if its SVCD support makes it worth three times as much as Sonic Solutions' MyDVD Video Suite or VideoWave for most users, but it never let me down with glitches, either.

Author, Author

These applications aren't the only DVD-related titles from their respective manufacturers. Ulead's DVD MovieFactory offers easy authoring with video trimming at a low price of \$44.95, while its MediaStudio Pro (\$495) expands on DVD Workshop's editing and authoring with in-depth audiovisual tools and a graphics generator.

Sonic's lengthy list includes DVDit! (\$299 to \$599), which has features similar to DVD Workshop's. Finally, Roxio's VideoWave Movie Creator eliminates part of the Power Edition's media library and some other features to sell for \$79.95.

For a look at DVD-writing software for Mac OS and Linux, see our sidebar at www.smartcomputing.com/cpumag/nov02/dvd. You'll also find a sidebar of

tips for finding the type of software you really want. And if you're looking for a DVD-authoring bargain, check out BHA's B's DVD, available as a \$19.99 download for a limited time at www.bhacorp.com/products/dvd.html.

by Marty Sems

Infinite Loop

Billions Of Bytes, Burgers, Sequins & SPAM

17 Approximate number of years for personal computer sales to reach 1 billion. ¹

17 Years it took McDonald's to sell its one billionth burger. ²

38 Number of years between the release of Elvis' first album and BMG's estimation that Elvis had sold more than 1 billion records worldwide. ³

22 Years between the production of the first can of SPAM and the sale of the billionth SPAM can. ⁴

Sources:

1. Gartner Dataquest
2. McDonald's Australia
3. elvis.com.au
4. The Official SPAM Home Page

DVD-Authoring Apps Up Close

There's a little something to like from each of the participants in our DVD-authoring roundup. Here's a look at how each app stacks up.

	Price	Pros	Cons	Contact	CPU Rating
Roxio VideoWave 5.1 Power Edition	\$99.95	Chock-full of extra video, audio, and design elements; friendly, but powerful	No SVCD support; no slideshows	Roxio (866) 280-7694 (425) 222-3210 www.roxio.com	3
Sonic Solutions MyDVD Video Suite 4.0	\$99	Packed with features, yet still very accessible to beginners	Slideshow transition jitters; needs a little polishing; no SVCD or Mini-DVD	Sonic Solutions (888) 766-4248 www.sonic.com	3
Ulead DVD Workshop 1.2	\$279 download; \$299 boxed	Prosumer-level versatility with a consumer-friendly interface	Most new users will find all they need in a cheaper suite	Ulead (800) 858-5323 (310) 896-6396 www.ulead.com	4

CPU Ranking: 0 = Absolutely Worthless 1 2 3 4 5 = Absolutely Perfect



check is useless for things words can't describe.

While we can't put into words the impact of a Nikon digital image, we can tell you a little about the camera that created this one. Introducing the Coolpix 995. It comes fully loaded with 3.34 megapixel resolution, 4x Optical Zoom-Nikkor lens, automatic exposure with manual override, a pop-up Speedlight, and a quick review feature that instantly allows you to scroll through your images. With this many options, the only limit is your imagination. Visit nikonusa.com or call 1-800-NIKON-USA.



Nikon

3.34 MEGAPIXELS
3.34 MEGAPIXELS

The Coolpix 995.

Jaguar: Apple's Cool Cat

Late one Friday night in August, a gaggle of supermodel types ogled the round-the-block line for a well-protected door in New York's SoHo

district. Something was wrong, however. This crowd was more casual and a lot less made up than the usual club kids.

Only Apple could make the glitterati confuse an incremental OS upgrade with a hip nightclub opening. But that's what happened with Jaguar, Apple's latest offering. It attracted

thousands of Mac faithful (including models) to check out the latest features at Apple's New York store.

Does Jaguar live up to the billing? It's not quite purr-fect, but OS 10.2 cements Apple's position as the premiere Unix provider on the desktop and will keep the Mac faithful happy, as Jaguar is heaven-sent for anyone running a cross-platform network.

The Net Works

If your Mac is on a network, buy Jaguar as soon as you put this magazine down. If your

Mac is on a network with PCs, put down the magazine now and go buy it.

Macs running Jaguar become full peers on Windows networks thanks to Samba, a version of Windows' SMB networking technology. Macs will appear in Windows Network Neighborhoods and Windows machines on Mac Go To Server menus. This is the kind of technology Apple is famous for: so well implemented, there's almost nothing to say about it. It just works. I mounted a Windows share on an OS X desktop in seconds; even the file types matched up and double-clicked to the appropriate applications.

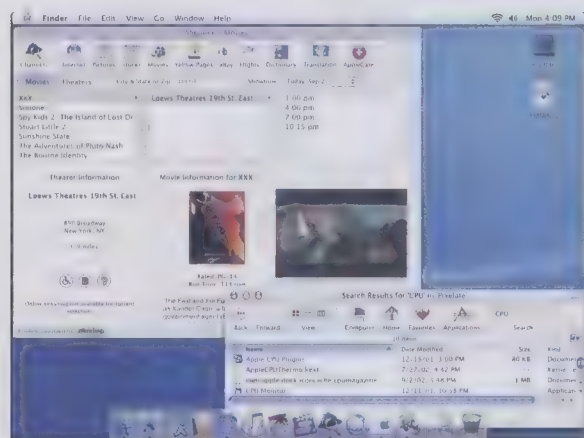
The other major new network technology in Jaguar is Rendezvous, Apple's implementation of the open standard ZeroConf for no-stress, no-configuration IP networking. Rendezvous also works effortlessly. Just bring an AirPort-equipped Mac into range of a Rendezvous network (or plug one into a wired network) and it will automatically detect servers, peripherals, and available services. To some extent, that's already available with Apple's AppleTalk and Microsoft's NetBIOS, but Rendezvous does all of this with cross-platform, industry-standard IP. The age of proprietary protocols, as far as Apple is concerned, is on the way out. Network managers should be cackling and rubbing their hands in glee.

These two moves are the most compelling reasons to buy Jaguar. Networking headaches may not be completely gone, but they're going to be a lot less worrisome.

A Raft Of Improvements

Jaguar is full of other tweaks, twists, and improvements, with a little something for everyone. USB Printer Sharing and spring-loaded folders—much-loved features of OS 9—are back. Finder windows have an attractive, integrated search box. File searches aren't instantaneous, but they're easy and addictive. Text smoothing makes fonts look a lot nicer in Internet Explorer and Mozilla, although Microsoft Office doesn't support it (unless you install the MS Office Service Pack 1).

QuickTime has been enhanced with MPEG-4 and AAC audio support, higher-quality formats than the previous MPEG-2 and MP3,



Jaguar

\$129

Apple

www.apple.com



10 Point What?

You may wonder what happened to Mac OS 10.1. The real skinny is that Jaguar should have been OS 10.1 because the original version of OS X should never have hit shelves.

Mac OS X 10 was missing major features; it couldn't burn CDs or play DVD movies and suffered from severe performance problems in the Finder. But the release of OS X gave Apple developers an incentive to start producing applications for the new OS.

The first incremental upgrade, 10.1, delivered the performance users should have had from 10.0, plus full support for CD-RW and DVD drives. Jaguar kicks OS X up a notch with a bucket load of new features. ▲



CPU Ranking: 0 = Absolutely Worthless 1 2 3 4 5 = Absolutely Perfect

but still open standards, unlike Microsoft's Windows Media. The Quartz graphics engine has been (finally) rewritten to offload much graphics processing onto modern graphics cards, though I couldn't see much of a performance advance with the new Quartz Extreme.

There are plenty of other measurable speed boosts, though. In my tests, system startup averaged 20% faster than with OS 10.1.5: 84.5 seconds compared to 103.5. Starting up Classic, the OS 9 application environment, took only a fraction of the time it did on 10.1.5: an average of 22 seconds compared to 89. And file searches, on average, were 66% faster than on 10.1.5.

Possibly the most curious new feature is Inkwell, a handwriting-recognition system built into OS X that works with Wacom tablets. Sure, it's neat and (mostly) works, but I'm baffled as to why Apple spent the R&D money to add a major feature for such a small audience.

iDunno About That

Apple's return to glory over the past few years has been on the back of groundbreaking applications. In 2000, iMovie was the first major consumer video-editing program and probably still the easiest to use. iPhoto, iDVD, and iTunes are similarly slick tools for organizing photos, DVD writing, and MP3 playing, respectively.

Unfortunately, Jaguar's software offerings—an updated version of Apple's Mail client, an AIM client called iChat, a system-level address book, and Sherlock, a Web-searching Swiss Army Knife—show less of a sense of focus than past offerings.

iChat has the most lost potential. The instant-messaging wars have left chatty geeks juggling three or four different IM systems. Who wouldn't love a slick, integrated messaging client? To solve this problem, Apple delivers a slightly cutesy AIM clone. (An IM for Apple: If you bother to develop an app,

at least make it superior to the shareware currently available. Both Alien Technology's Proteus and epicware's Fire mop the floor with iChat by offering AIM, ICQ, Yahoo!, and MSN messaging in one tasty package.)

The new Address Book is inferior to (freeware) Palm Desktop, but at least there's method to that madness; it's really just a portal to a new system-level address book service based on LDAP and compatible with Windows' Active Directory. The tight integration between the address book, Mail, and iChat (you can send mail from iChat or instant messages from Mail) shows what can happen if corporate IT managers or third-party software authors decide to pick up this database and run with it.

Sherlock is a bit more compelling (but not much) because it's a clone of Karelia Software's \$29 Watson application. All the same, it's a convenient way to do common Internet searches for stock prices, movie times, and eBay items.

There are still some iReasons to buy Jaguar. I got a peek at a beta of iCal, the calendar application available by separate download, and liked what I saw: easy management of multiple calendars and calendar sharing via either OS X's built-in WebDAV server or Apple's .Mac online service. By using the open-standard SyncML, the upcoming iSync system extension may bring some rationality to the woolly world of syncing computers with diverse handheld devices.

And I hear that when the stars are right, some really neat things can happen. For instance, a Bluetooth-equipped Mac can treat a Bluetooth-equipped SyncML-compatible cell phone such as the Sony Ericsson T68 as a peripheral. Caller ID for calls on the T68 pop up on the Mac screen, and you can use the Mac address book to send SMS messages with the T68. I was unable to test these features, unfortunately, because

10 Highlights Of 10.2

Apple promotes OS 10.2 as having more than 150 new features. Here are 10 that might win you over:

1. Faster, faster, faster
2. Cross-platform file sharing with Windows
3. Configuration-free Rendezvous IP networking
4. Pretty good junk mail filter on Mail client
5. MPEG-4 and AAC video and audio support
6. System-wide, integrated address book
7. Terrific calendaring client
8. Synchronizes Palms, phones, and iPods
9. Better power management
10. FreeBSD 4.4 core

Apple wouldn't make iSync or the Bluetooth adapter available to me.

Jaguar's Bottom Line

These new features come with a punch line: \$129 for most Mac users. The blow is softened by Apple's "family pack" of five licenses for \$199, but there's no upgrade price. That's a shocker coming after the \$20 upgrade from OS X to 10.1.

For those running OS X in an office or other cross-platform environment, buy this upgrade immediately. For those still running OS 9, this is the OS X you've been waiting for; take the plunge. And for Windows or Linux users who have been considering a Mac OS, this is a strong, feature-laden, nearly uncrashable system built on an excellent FreeBSD 4.4 core, and it's worth at least a look.

Existing 10.1 users should weigh their desire for the new features and thank Apple for what they're not getting: no invasive software activation scheme, for starters. What you do with Jaguar is still pretty much your business, which is more than can be said for XP. ▲

by Sascha Segan

Files For Philes



01000010 01100101
01110011 01110101
01110010 01100101
01110100 01101111
01100100 01110010
01101001 01101110
01101011 01111001
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I'll answer any question you ask, personal or professional. Go ahead; give it your best shot. "What's your favorite software?" Good question, but an impossible one at that. Instead of narrowing it down to one title, how about I give you a roundup of my picks, plus one I'm not fond of? "That'll do, pig."

Reading newsgroup or email threads in Outlook Express can be a chore once you're faced with a multi-authored post. The amount of greater than symbols is often greater than your eyes can handle. An enterprising developer came up with OE-QuoteFix (jump.to/oe-quotefix), a free "invisible" extension to visually organize the message window using both colors and reformatting. Conversion is done on the fly and has improved my ability to follow a train of thought without trying to figure out who said what.

Google is THE search engine, and we all know that. I don't care what Teoma or the others say. Most of us have come to rely on Google's speed and accuracy. The Google toolbar, while fully functional, isn't as useful as the Google@SearchTool (www.frysianfools.com/ggsearch), a free standalone program developed by a fellow Google fanatic. It sits silently in the System Tray, and when you're ready to enter your query, it'll reveal a compact window in which you can enter the keywords. It's completely unofficial but completely indispensable.

I remember the day when the cursor was nothing more than a large solid-green or amber block. Someone decided that an arrow would work better in a GUI a few decades ago, and we haven't evolved much past that. Sure, a shadow comes attached to the Windows 2000/XP pointer, but it could be and do so much more. It's time to delete that fat, yellow dinosaur and pick up CursorXP (cursorxp.com). What's the "point" of customizing your cursor? Because it's fun! You can animate and add sounds to events, break the 32 x 32 barrier, and take advantage of the alpha-blending wonders of your OS.

I finally got around to redesigning my blog the other week. In the end, I was satisfied with my Notepad-driven labor. In my years of Web-page development, I've come to rely on CSS more and

more heavily. TopStyle from Nick Bradbury, the guy who created HomeSite (bradsoft.com/topstyle), is the only Cascading Style Sheets editor/manager I could possibly use today. With so many elements to organize and conventions to memorize, coding without it is like eating a peanut butter sandwich without the jelly: sticky without a sweet payoff.

There are a million and one FTP clients out there (and I honestly don't know why). Back when 3.x was the only Windows in town, we were stuck with WS_FTP—quite possibly the worst designed file-transfer program ever. It's a legacy name and application, but that doesn't mean we're forced to put up with its inadequacies. I dumped FTP Explorer because its author abandoned it mid-beta, and my FTP Voyager license was up for renewal.

I'm giving my vote to the very able SmartFTP (smartftp.com). This feature-rich free file is definitely worth your attention, especially if your current choice ain't cuttin' it.

Years ago, I revealed a secret way to dramatically boost the operation of Windows 98 SE on a nationally syndicated radio show ("Online Tonight" with David Lawrence). To this very day, he still gets calls from listeners asking how to do it and if there's an equivalent for other versions of the OS. My answer

is now simple and comprehensive: Cacheman (outer tech.com), the ultimate memory manager/system performance enhancer known to the human race. Speed, in an operating system's case, seldom kills.

And is it just me or is Winamp3 (winamp.com) a major disappointment? It looks like the old player, sounds like the old player, and requires more system resources. Yes, there's a new skin engine, but it comes at what cost? It seems to launch and unload slower than 2.x on my 1.2GHz PIII, needlessly provides playback for AVI and WMV files, and comes equipped with the butt-ugliest media manager on the planet. Free the software is. Necessary the software is not.

I love this industry. ■

**Years ago, I
revealed a secret
way to dramatically
boost the operation
of Windows 98 SE
on a nationally
syndicated radio
show . . .**

You can dialogue with Chris at
chris@cpumag.com.

Things To Be Thankful For



Pete Loshin is a former technical editor of software reviews for BYTE Magazine (print version). He is also the author of "TCP/IP Clearly Explained" (4th edition available everywhere real soon now) and covers network protocols, security, and open-source software.

After the cranberry sauce has congealed this Thanksgiving, let's give thanks for free software that threatens the status quo.

How can you be sure that a proprietary encryption program is free of backdoors? Without the source, you can't. That's why in 1991 Philip Zimmermann published PGP (Pretty Good Privacy), software capable of doing munitions-quality encryption good enough to protect government secrets. That rocked the boat, but when PGP's source code surfaced on the Internet for international download it nearly put Zimmermann in prison. Though not strictly "free" (the license restricts commercial use, for example), PGP was free enough to cause trouble.

PGP worried officials that terrorists, criminals, and others would use strong encryption to further their evil schemes. It's true: The bad guys do use encryption, just as they use telephones, autos, and airplanes. Yet, strong and open encryption can (and does) protect those struggling for human rights around the world.

Speaking of evil, SATAN (Security Administrator Tool for Analyzing Networks) was very scary when it hit the scene in 1995. This free network scanner program let crackers probe any network for easily exploitable vulnerabilities, but the hype was unfounded. SATAN alone just reveals vulnerabilities. Smart sysadmins downloaded SATAN to probe and fix their networks—but SATAN still strikes fear in the hearts of uninformed IT managers.

The hacker group cDc (Cult of the Dead Cow) came out with a far scarier tool, the BO (Back Orifice) "Windows Remote Administration Tool." According to the cDc Web site, BO "allows a user to control a computer across a TCP/IP connection using a simple console or GUI application." It's small and "entirely self installing . . . [t]o ease distribution, BO can also be attached to any other Windows executable . . . [o]nce running, BO does not show up in the task list or close-program list, and is rerun every time the computer is started."

In other words, the perfect trojan. Sure, sysadmins might like it for remote support, but crackers like it, too. BO not only served the industry by exposing the seriously flawed Windows security, it is also undeniably useful for sysadmins. The furor following publication undoubtedly inspired sysadmins

to lock down their networks at least as often as it inspired new script kiddies.

Once cleared, Zimmermann started PGP Inc. to market PGP commercially while keeping the source available. Acquired by Network Associates in 1997, PGP source was gradually closed as NA updated it. In August a newly formed PGP Corp. stated it had acquired rights to NA's PGP business, though it's not clear if it will release PGP code. In the meantime, GnuPG (GNU Privacy Guard) stands in for PGP as the default encryption program for Linux.

SATAN, produced by Farmer and Venema to demo their work on security, hasn't changed since 1997. SAINT (www.saintcorporation.com) develops and markets the SAINT scanner based on SATAN.

BO is still available, with support for Win2000, as well as a *nix client that lets you "own" Windows systems from a *nix box. No word on WinXP versions yet.

**. . . neither do I
want the MPAA
dictating how I can
use legitimately
purchased DVDs.**

Free The DeCSS

DeCSS is the program that unscrambles the laughably weak "encryption" used on most DVDs: CSS (Content Scrambling System). DVD players must decode CSS content; DeCSS, published online

anonymously in 1999, is an open-source program for viewing scrambled DVDs.

Though ostensibly designed to prevent DVD piracy, CSS does nothing to do this while restricting consumer access to DVD content. Big-time pirates copying DVDs exactly produce exact copies of the scrambled content; CSS does nothing to stop that. But DeCSS scares Hollywood because it lets people in any DVD region view any DVD, view any content in any order, and even skip the FBI warning.

The Motion Picture Association of America has been filing lawsuits against anyone daring even to publish a link to the DeCSS source, let alone the source itself, and spinning the news to turn open-source advocates into criminals.

I don't advocate piracy, but neither do I want the MPAA dictating how I can use legitimately purchased DVDs. I certainly don't want to lose the right to freedom of expression as corporations manipulate the courts to smother any free software that inconveniences them. ■

Get saucy with Pete at opensauce@cpumag.com.

Words From The Web

YEAH, THEY ACTUALLY SAID THIS . . .

Flame posted on Anna Kournikova's official Web site (www.annak.org) message board:

Go back to downloading nude pics of R2D2.

Don't bother. They're fakes.

From an Excite chat room:

I'd say the ladies are up on the men 250-3 for great comebacks tonight.

We're not very bright, as you can tell from the drool.



From a People.com message board about Anna Nicole Smith's reality-TV show

Does it have to run the allotted amount of episodes before they cancel it?

And another...

I think this is the first time in my life when I've envied Helen Keller.

The Guess? Jeans hottie became a gold-digging fatty. Who wants to see that?

Soul Searchin'

As far as I'm concerned, few things are fringier than new-age "philosophy." New ageism isn't my bag, but if it's yours, grab a fistful of agate crystals and go to the Astral Traveler Web site (www.astraltraveler.com), a clearinghouse of information for I Ching-throwing, spirit-wandering stargazers. Hey, is that a Shiva Lingam in your pocket, or are you just happy to see me? The Web site's spacey flash intro actually looks pretty cool, although it's the kind of thing I'd expect to see at a sci-fi film's Web site, which this definitely isn't. Still, it effectively sets the mood. If you have a metaphysical yen, this Web site should be your first stop.

Astral Traveler has six primary sections, each containing a healthy dose of information about new-age concepts. The Anima section explains what auras and chakras are (as if you didn't know already). The Realities section is a new-age perspective on dreams, time, and time travel, which I found to be a little on the loopy side. The Healing section is, well, you can guess what that's about. My favorite section was the Eridu Gallery, which contains some interesting artwork, including cool fractal designs. ▲

Infinite Loop Going Up & Up & Up...

Rockets and space planes are so 20th century. In about 15 years, you may be able to take an elevator to space. HighLift Systems (www.highliftsystems.com) is proposing to build such an elevator. The elevator shaft will be a ribbon made from a carbon nanotube composite material, with one end attached to a space platform just outside of geosynchronous orbit and the other to a platform in the Pacific ocean. The space elevator would initially haul satellites and equipment into space, but at some point, regular slobs like us could buy a ticket to the top floor.



Pop This!

IN AUGUST 2002,
EARTHLINK ANNOUNCED
IT WILL OFFER POP-UP
BLOCKER TO ITS USERS.
POP-UP BLOCKER, WHICH IS
AVAILABLE AS A FREE DOWNLOAD
FOR **EARTHLINK** USERS
(WWW.EARTHLINK.NET/POPUPBLOCKER),
WILL ZAP ANNOYING
POP-UP ADS SO YOU
CAN SURF WITHOUT DISTRACTION.
LET'S HOPE THIS IS A TREND.
DO YOU HEAR THAT AOL?
HUH? **DO YA???**

SlamBall

The inaugural season of SlamBall was over almost as soon as it began, but the Official SlamBall Web site is still worth checking out. The well-designed site is full of photos and videos of the year's best SlamBall action. You can even practice a few SlamBall moves with an online video game. Not enough for you? Fill out a player application so you can get your game on for real.

slamball.warnerbrothers.com



The Who?

It's no wonder that today's musical acts have to choose oddball names like Hoobastank, Mudhoney, and Justin Timberlake. All the good names have already been taken by fictional TV and movie bands. Check out the Rocklopedia Fakebandica at www.vgg.com/tp/tp_080700_fakeband.html for a complete list. But before you do, test your fake band knowledge. In what TV show or movie did the following fake bands or singers appear?

Band

1. Andromeda
2. Diamonds in the Rough
3. Johnny Bravo
4. Stillwater
5. The Kinky Wizards
6. The Larry Davis Experience

Movie/TV Show

- A. "High Fidelity"
- B. "The Brady Bunch"
- C. "The Simpsons"
- D. "Buck Rogers In The 25th Century"
- E. "Almost Famous"
- F. "Saving Silverman"

Answer key: 1.D. 2.F. 3.B. 4.E. 5.A. 6.C.

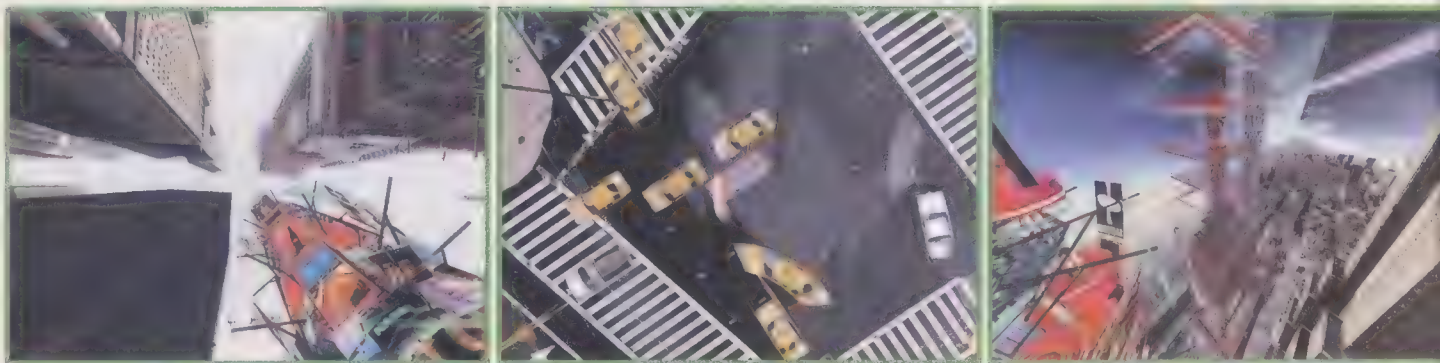
A COMPUTER MAGAZINE with a WEB SITE?

Yeah, it's a crazy idea, but that's the cutting-edge, throw-caution-to-the-wind kind of publication we are. This "Internet" thing may pan out after all. www.computerpoweruser.com

IF YOU FIND A STRANGE, INTERESTING, OR FUNNY WEB SITE IN THE COURSE OF YOUR INTERNET TRAVELS THAT YOU THINK IS WORTHY OF FRINGE, SEND YOUR SUGGESTION TO FRINGE@CPUMAG.COM.

NEWYORKEXITNEWYORK

A Tale Of Two Cities & Tomorrow's VR Experience



Think about the typical virtual reality experiences you've had or seen. A person wears a massive set of stereoscopic goggles that blots out the world and, unless perfectly adjusted, results in a blistering headache and/or desire to toss his lunch. The VR world is generally blocky, with a low color palette and creeping frame rates. After all, it takes a lot of silicon horsepower to generate a completely virtual time-space and make it interactive in real-time. To achieve this, the result has been VR worlds that are largely static, unconvincing, and boring as dirt. No wonder no one talks about virtual reality anymore.

But what if VR's chief drawbacks could be turned around? What if the data vs. bandwidth problems could be cured? What if a VR world could look not just good, not just cool, but downright mind-blowing? And what if building such a world were within the grasp of ordinary computer users, not only coding savants?

In 2000, two Parisian students were thinking along these lines. They came to New York with a vision, returned home to France, and created something that may well change the way we conceive, look at, and construct virtual space—and that includes the virtual universe that will soon be streaming to you across the Web.

Stage 1: Preparing The Canvas

In 1999, Priam Givord and Martin Lenclos were pursuing their graduate

degrees in Paris. Givord was finishing a degree in industrial design, and both were seeking the equivalent of a master's in computer graphics. Only a few months from their objective, the two conceived of a grand artistic vision, something that would blend their interests in architecture, computer science, and visual creativity. They applied for time off from their degree program and were granted a year and a half to bring the vision into reality. The only money they had to use was from their own pockets.

In a nutshell, Givord and Lenclos wanted to create a 3D virtual reality landscape based on reality but make it compact enough to be portable and stylish enough to be visually engaging for the viewer. The first task to tackle was the VR landscape. Neither of them had the time or patience to endure the traditional manual coding of a virtual world, so they turned to longtime friend Bertrand Duplat, the founder and CEO of a Paris-based company called Virtools.

Virtools. Duplat started Virtools in 1993 with the mission of creating virtual reality presentations. Initial customers included large companies such as Peugeot and Airbus Industries, but soon enough Duplat wanted to bring virtual reality capabilities to a broader customer base. What was needed was some kind of editing environment in which a user could create her own VR environment relatively quickly and easily. Duplat created the first edition

of the Virtools Behavior Engine, a technology that governs how objects can function in virtual space, and his company soon cultivated a suite of advanced tools that find application the world over in everything from games to corporate presentations. The Virtools client roster includes names such as Intel, IBM, Razorfish, Vivendi Universal, Disney Imagineering, Electronic Arts, Acclaim, and many others.

Givord and Lenclos were given privileged access to Virtools software and the support staff behind it. Still, it took them two months to get up to speed on the applications and to make sure that their basic concepts for the project could work. "We started from real photographs and compressed and downsized them as much as possible while keeping the grain and the low-quality aspects of the material," explains Givord. "I don't mean low-quality in terms of the photograph, but rather rich in noise and grain. We wanted to have this warmth in the picture and in 3D space, as well. We were aiming for a photographic, blurry, noisy point of view rather than super-precise, computer-rendered material. Nothing we have is computer-rendered. We extract from the real what we want."

The heart of the project's style depends on noise. Givord likens it to the difference between music on vinyl vs. CD. Digital discs sound sterling clear, but they lack the very subtle, almost indefinable imperfections and extensions of sonic

range that continue to make vinyl a favorite among some audiophiles.

In this case, it was the noise of digital compression the two were after. When you take a raw photograph and compress it with the JPEG or a similar



algorithm, seemingly random artifacts appear as the color palette is reduced and pixel blocks become more obvious. With enough compression, the image starts to look a bit like an impressionist painting. If stretched, these heavily compressed images take on an odd, in-motion appearance that is entirely different from the appearance of a Photoshop motion blur effect, for example. The image of one car in virtual space may be 500 pixels long, but the car next to it may only be 30 or 40 pixels long. In 3D, both cars look to possess the same dimensions, but the 40-pixel car will have a radically different, almost abstract appearance.

Givord and Lenclos felt that this digital noise would lend itself best to a physical subject itself grounded in noise, motion, and structured chaos. What space could be more appropriate than New York?

Stage 2: Paints & Brushes

The two artists gathered what photographs they could of the city and set to work with a scanner and Photoshop. They were able to achieve a wide range of stunning effects on subjects, but it soon became apparent that they needed much more source material. In order to create a virtual New York, they needed to visit the real thing.

So Givord and Lenclos packed their bags and hit the Big Apple—Manhattan,

to be specific. Armed only with digital cameras and camcorders, they wandered the packed city streets and climbed to the tops of New York's highest buildings, cataloging, chronicling, and seeking inspiration around every corner. All in all, over

three weeks the pair amassed more than 6,000 images and videos covering a 2.5-square mile swath of towering, bustling New York. They returned home and set to work in earnest.

It took two months just for Givord and Lenclos to extract their objects and create the database of elements that would become VR NYC. After that came the long job of pasting these elements into Virtools software.

"First, we observed and got information on how New York is laid out—its size of buildings, the size of sidewalks, the way signs are put on the streets, stuff like that," says Givord. "With that, we started to build an impressionist city with all of this material. There are no light sources, no extra 3D functions. There are just textures, a few animations, and all the rest is alpha channels, planes, and meshes, all set up in real-time with Virtools. See, with Virtools, there is no rendering. It's all WYSIWYG from the start. You're just in this environment. You put something in a place, and there it is in real-time. So we basically painted the whole city in three dimensions."

In essence, the process of re-creating the city in virtual space is largely one of drag-and-dropping elements. Because the designer is actually in the environment placing image planes (remember that the elements are arriving from Photoshop as flat pictures) into space, the analogy of

painting is a loose one at best because the artist has no canvas. Virtools-based creation is more like building a vast free-floating sculpture with playing cards. One Microsoft program manager has commented that Virtools lets programmers achieve a prototype in weeks rather than the usual months. Without a Virtools-like workspace, Givord and Lenclos never would have been able to complete their project in the time they had remaining. As it was, from the first shutter click to the last pedestrian placement, they finished NEWYORKEXITNEWYORK in less than five months.

Stage 3: Reality & Beyond

The virtual reality project first went live before the public at France's Moulin de l'Image exhibit on July 16, 2001, and toured for a year before more recently appearing at SIGGRAPH 2002 in San Antonio, Texas, last July. The experience is unlike any other VR trip. The virtual arena, which primarily encompasses The Village, Wall Street, and Times Square, resides on a Xeon-powered PC backed by 1GB of DDR memory and a GeForce4 Ti 4600 graphics card. The world is beamed through a digital projector onto a 23-foot-wide blank wall. The user flies through the space via a Thrustmaster joystick, diving under fleets of traffic suspended in midair and soaring high above the skyscrapers for an eagle's eye perspective.

If you aren't able to catch the interactive exhibit at any of its rare public appearances, you can still get a taste of it at www.newyorkexitnewyork.com. Fourteen still image thumbnails adorn the top of the site. Click any of them for a larger view of the shot. (Our two favorites are the pictures in the top-left and top-right corners.) What seems amazing is the sense of vibrant activity that permeates most of these low-res stills.

Just below the thumbnails is a collection of four video clips captured from VR fly-throughs offered in both QuickTime and Windows Media versions. The first of these offers probably the most complete impression of what a NEWYORKEXITNEWYORK experience would be like. As the viewer, you

Top Brass

We spoke with Priam Givord, co-creator of NEWYORKEXITNEWYORK, about his virtual reality project with Martin Lenclos.

CPU: Was creating your virtual New York like creating a painting?

Givord: It's like painting, but the difference is that there is not even a canvas. You have the ability to make your database appear in the software itself, and you drag and drop your picture elements, and they end up as planes within the space. You see the plane, turn it around, give it an alpha channel if you want, resize it—we did that in Photoshop mostly, but you can do it in Vortools now—and we compress it, as well. Compression makes very interesting noise. Actually, engineers call it noise but we use it as a signal that gives a lot of warmth.

CPU: Can regular people pursue 3D virtual space creations like yours as a hobby?

Givord: Anybody can make it as long as they work with sensibility. If you look at our work, every picture is a patch. We place everything by hand, and we downsize, choosing the right compression and right trans-

parency. We do the alpha channels by hand, as well, for each of the little textures that are there. You may want just large objects like buildings or get down to details like tiny doorsteps. It's just up to your sensibility.

CPU: Creating art with technology is often a methodical, preplanned process. Was that your experience with the NEWYORKEXITNEWYORK project?

Givord: We invented a style. It could have been done using any program with a real-time interface that lets you place things in a 3D space, but the key is not having to code. You want to be able to refine on the spot, not afterwards. It's like when a technician tells you, "You stupid, you should have thought beforehand what you wanted to do." But you don't want to hinder your brain by thinking it out before. Often, you never have the idea of a final painting before you're actually making it.

CPU: What's fascinating about your style is that while



Priam Givord (left) & Martin Lenclos are the minds behind the NEWYORKEXITNEWYORK project

most computer graphics strive for accuracy and realism, your approach does the exact opposite. Don't most artists hate compression because of its artifacts?

Givord: Yeah, but that's obsessive control—well, whatever. I'm not going to pursue that. It's a psychological trait. But we're not like that. We think differently. Even technically speaking, the size of the file is 40MB, and the size of

the physical space is 2.5 square miles or something like that. And this is something that can be done on affordable PCs. We're showing that it's not the technology, it's how you use it. You don't have to be such a control maniac. We're trying to find shortcuts that are graphically lively and warm and interesting using today's desktop hardware. Hopefully, that will be the project's lasting value. ▲

fly up from 50 feet or so below the level of traffic and down under the cabs and other vehicles, buzzing around shoppers, walkers, and street cops. Giant skyscrapers, new construction, and advertising are everywhere, and little animations scrolling across the sides of cars give the impression of moving traffic even though the vehicles never change position.

NEWYORKEXITNEWYORK is not the way to learn the city's turn-by-turn layout. Rather, it is an impressionist representation of those streets that leaves one feeling a sense of "New York-ness." More significantly, the art behind NEWYORKEXITNEWYORK may have broader implications for future

Web design. Compared to most virtual environments, the 40MB that comprises this virtual New York is a trifling amount of file space, but such low overhead is achieved only through the heavy compression that fuels the project's appearance. Whereas most 3D environments aim for precision and suffer from massive file sizes that make them all but impossible to navigate over an Internet connection, the world of NEWYORKEXITNEWYORK is within reach.

Perhaps the methods Givord and Lenclos employed will soon become de rigeur among site designers wanting to take visitors inside their products or geographies. We might not be able to see a juniper tree blowing in a Yosemite

Park breeze, but we could experience an impression of it as we float at will across the landscape. Compared to the handful of static images available today, this new approach seems eminently desirable, although both VR and photographic representations would surely be offered in tandem.

Today, Lenclos works for an architectural design company and Givord is employed making virtual reality display walls and haptic (force feedback) systems. With luck, maybe the next release from these minds will have us feeling a landscape with our hands as well as floating through it. **CPU**

by William Van Winkle

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Coder's Corner: XML

Core XML

The XPath Language, Part I

In Coder's Corner: XML, Ian Graham shows you how to program with XML. Ian is the author of numerous books pertaining to Web development, including "The HTML Sourcebook" and "The XML Specification Guide."

Last month we looked at XForms, the XML standard for forms that the W3C is developing. We used a simple example to illustrate how XForms work but avoided talking much about XPath, the XML path language. XPath is used to reference parts of an XML document, such as elements, attributes, etc. If you're going to wire up an XForm, you need to create references that point from one place in the form to another.

This month and next, we'll focus on XPath details. XPath is more than just a tool for XForms; it's a cornerstone for many core XML technologies, including XSLT, a language for processing XML, and XML Schema, a language for defining rules for constructing specific types of XML documents. It's fairly impossible to understand these technologies if you don't understand XPath basics.

XPath's Not XML?

XPath is core XML, but XPath expressions aren't written in XML. Instead, they're simple text strings that use a special notation to express the path to places (called nodes in XPath) in an XML document. This is necessary because XPath expressions are often used as attributes' values, and such values cannot contain markup.

For example, the XPath expression /main/a references elements named "a" inside an element named "main," which is the root element of a document. This expression type, called a location path, is like an absolute path to a file, starting from the root of a computer's file system. The similarity is intentional and helps make the notation easier to learn.

One important difference from directory paths is that a single XPath expression can reference more than one node. For example, given the following document, the expression /main/a references a node set consisting of two nodes: the document's two a elements. XPath provides additional mechanisms, discussed later, to narrow down this selection:

```
<?xml version="1.0" ?>
<?xml-stylesheet href="test1.xsl"
    type="text/xsl" ?>
<main>
  <a> <!-- main.a(1) -->>
    <b> <!-- main.a(1).b(1) -->>
      <c> main.a(1).b(1).c(1) </c>
      <c> main.a(1).b(1).c(2) </c>
      <c> main.a(1).b(1).c(3) </c>
    </b>
    <!-- main.a(1).comment(1) text -->
  <b> <!-- main.a(1).b(2) -->>
    <c> main.a(1).b(2).c(1) </c>
    <d> main.a(1).b(2).d(1) </d>
    <q> main.a(1).b(2).q(1) </q>
  </b>
</a>
<?processing-instruction properties_for_PI ?>
<a> main.a(2) </a>
</main>
```

The preceding example references one node type, namely element nodes. The XPath model actually supports seven node types, including:

- Element nodes—an element and all its content.
- Text nodes—the text content of an element.
- Comment nodes—the text inside an XML comment. (In XML, comments are any text between a starting <!-- and an ending -->.)
- PI (processing instruction) nodes—special markup of the form <?instruction parameters ?>.

Unlike the XML declaration (`<?xml version="1.0" ?>`) that appears at XML document's start, PIs can appear anywhere, even outside the document's root node (as with the first processing instruction `<?xml-stylesheet . . . ?>` in the example.)

- The root node—a special node containing the entire XML document. This example's root node includes the first PI and main element.
- Attribute nodes—the attributes of an element (except xmlns attributes defining namespaces).
- Namespace nodes—the attribute nodes that declare namespaces prefixes, such as `xmlns:pre="http://www.foo.org/ns2"`. XPath keeps these separate because many XML processing systems, such as XSLT, keep special track of namespace information.

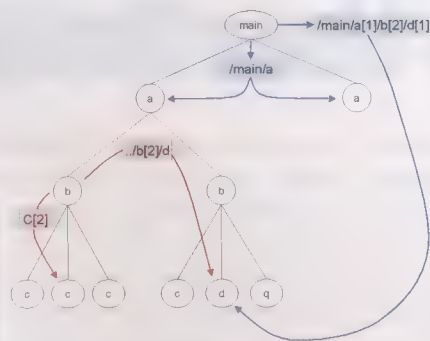
These are all referenced differently. This column focuses on element and root nodes. We'll look at the others next month.

Absolute Path Expressions

The string `/main/a` is an example of an absolute path expression; it defines the absolute path to a set of nodes, starting from the document element. An absolute path starts with a slash followed by the path down from the document element. Thus `/main/a/b` is an absolute path expression selecting all elements named `b` that are children of elements named `a` that are children of the document element (`main`).

The absolute path expression `/` (a slash by itself) is special; it selects the root node, namely the node containing the entire document. In the example, this includes the first processing instruction (`<?xml-stylesheet . . . ?>`) and the document element.

In our example, the expression `/main/a` references two nodes. To further restrict the selection, XPath lets you reference the specific element node(s) you want by placing the node's number after the node reference. So, the expression `/main/a[1]` references the first `a` element child of the main element, while `/main/a[1]/b[1]/c[3]` references a unique element named `c` (the third child of the first child `b` that's the first child of the first `a`). Note, however, that the expression `/main/a[1]/b/c[1]` references two element



This illustration details simple XPath expressions applied to an example document tree, showing the nodes they reference. The blue lines are absolute location paths. The red lines are relative ones.

nodes because this references both `b` elements inside the first `a` element, and both of these contain a `c` element.

Absolute paths are always evaluated starting from the document's root. Conversely, relative location paths are evaluated with respect to a position somewhere inside the document. This position is called the context node, as relative paths are evaluated relative to this context.

Relative paths don't begin with a slash. Instead, they begin with an expression that references a path starting from the current context. For example, the expression `a` selects all elements named `a` that are children of the current context. Thus, if the current context is `main`, this expression selects the two `a` elements that are children of `main`. However, if the current context is the first `a` element, this relative expression references nothing; there are no `a` elements that are children of this element.

Let's suppose the current context is the first `b` element inside the first `a` element inside `main` (`main/a[1]/b[1]`). Given that context, here are some simple relative path expressions and the element nodes they reference:

- `c[2]`—references the second `c` element child of the current context.
- `.`—(a single dot) references the current context itself, (`main/a[1]/b[1]`).
- `..`—(double dots) references the parent element of the current context (such as the parent `a` element).
- `../b[2]/d`—references the parent element (`a`), and from there, the second

child `b` element of that parent, and from there, any `d` elements that are children of that `b` element.

- `../b[2]/*`—references the parent element (`a`), and from there, the second child `b` element of that parent, and from there, all elements that are children of that `b` element. The `*` is a special wildcard that selects for all element nodes.

The best way to learn about XPath expressions is to experiment with them. To help do this, an XML document example is provided at www.cpumag.com/nov02/xml, with the following XSLT style sheet:

```
<?xml version="1.0" ?>
<xsl:stylesheet version="1.0" xmlns:xsl=
"http://www.w3.org/1999/XSL/Transform"
>
  <xsl: START NODE output method=
"xml" indent="yes" />
  <xsl:templatematch="/main/a[1]/b/c[1]"
> <!-- edit the XPath expression !! -->
    -- <xsl:copy-of select="." /> -- END
NODE
  </xsl:template>
  <!-- Following overrides builtin template
that copies over text + attribute nodes --
  <xsl:template match="text()|@"*>
</xsl:template>
</xsl:stylesheet>
```

This style sheet processes an XML document looking for nodes that match the XPath expression defined in the `xsl:templatematch` element (such as `match="/main/a[1]/b/c[1]"` shown above). If it finds a node that matches this expression, it writes out the string `START NODE`, followed by a copy of the node referenced by the expression, followed by the string `—END NODE` (so you'll know where the match ended). The result is a list of the nodes referenced by the XPath expression.

Plug these examples into an XSLT processor and modify the XPath expression in the `xsl:templatematch` element to see the output. For XML tools that do this, see www.cpumag.com/nov02/xml.

(NOTE: Full examples of the documents in this article are available at www.cpumag.com/nov02/xml and www.utoronto.ca/ian/articles/nov02/.) CPU

by Ian Graham

Web User Testing: Part II

Welcome back! If you missed last month's article, we discussed the importance of conducting a user test before you jumped into production and how to create a testable prototype that illustrated a particular task. In Part II of this three-part series, I go into more detail on how to prepare for a user test.

Go For Realism

Your most important tool in testing, of course, is your prototype. If your prototype does not simulate the real experience of the eventual Web site, you are wasting everyone's time. By realism, I mean each page of your graphical click-through prototype should look like a real Web page, be displayed in a browser, and include the actual text and graphic design you plan on using. For example, don't use Latin text as a placeholder for real text and don't use quick sketches where images should be. Users will focus on these abnormalities instead of the functionality of the site.

Semantics Are Key

In keeping with the realism theme, the word choices you make for things like navigation bars and headlines are of utmost importance. I believe that semantics account for most of a site's usability problems. For example, one client insisted on using the phrase "Scheduled Courses" for the button that linked to the course registration area. Internally, the company thought of "Scheduled Courses" as courses that people needed to sign up for to reserve a spot. When I asked users "how would you sign up for a course?" they searched the screen for a button labeled "Sign up" or "Registration" and completely ignored the "Scheduled Courses" button.

The lesson here is that your prototypes should use actual text and phrases that you plan on using in the real Web site. This way, when you test the prototypes with users, they can give you valuable feedback as to your word choices and can even help you come up with better alternatives.

Testing Methodologies

While developing your set of click-through testing prototypes, you must also figure out your testing methodology. A testing methodology is nothing more than making a standard plan of who you'll test and how you'll test them. Determine the number and type of people you want to test who fit your target audience. For example, for an online candle shop, you may want to find seven to 10 middle-class men and women aged 40 to 45 who shop online. (For best results, I

recommend that you test at least seven people. Testing fewer people than this does not give you an accurate gauge of how severe or minor usability problems really are.)

You should also figure out how and where you'll conduct the test. You do not need to rent a high-end, two-way mirror facility in order to conduct an effective user test. All you need is yourself, a note taker, a computer, and a few willing volunteers. In fact, I find this more relaxed approach to be less intimidating to a user, and you'll get more reliable results. As long as you test everyone under the same conditions, you'll have a solid basis for

comparison later.

I like to prepare five to seven different tests and build a click-through prototype for each one. Each test focuses on a particular task, such as ordering multiple candles, and has between three to five pages that users must click through. Remember, each page of your test represents a click that users must perform in order to complete a task. If you have a 10-page prototype for one task, that's 10 clicks! From a usability standpoint, the fewer clicks the better.

Next month, I'll discuss how to conduct a user test, including how to find people, what questions to ask, and how to evaluate your findings. ■

You can contact Lisa at lopuck@cpumag.com and see her work at www.lopuck.com.

**The word choices
you make for
things like
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and headlines
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Lisa Lopuck, www.lopuck.com, is a Web creative consultant helping companies define and plan their Web creative strategy, information flow, and visual look and feel. She is also the author of numerous best-selling books on Web design, including "Web Design for Dummies," and is a sought-after speaker at Web conferences and universities around the world.

targtads.txt



Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the 'Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.

The advertising industry is in a state of chaos. For the first time in years, advertising revenue is down. The effects of this change are far reaching: It hits radio, print, TV, and most of all, the Internet. Some content that you like will be blended with the advertisements as advertisers wield their muscle against a desperate media industry. Other content will go away, unable to survive the downturn.

The worst part of this is the continued blending of advertising and content. It's no secret that this has always happened. From E.T.'s colored candy to the product placement on sitcoms, tiny commercials have long been a part of all forms of media. But these days it's getting even worse. The introduction of Vanilla Coke was an almost comical example, as it appeared as the subject of various talk shows and even on supposedly legitimate news programs.

This happens because advertisers control the media. This is no surprise: TV does not exist to give you entertaining programming. It exists to give advertisers your eyeballs. If you tune in, they can sell you to their advertisers. This is true of the vast majority of media, from radio to the magazine that you hold in your hands.

Now this isn't a bad thing. Advertisers supporting content is a fair trade. In exchange for seeing a few commercial messages, we get countless hours of entertainment and information for no out-of-pocket costs. Our time has been traded. We see an advertiser's message, and we are rewarded with an article about advertising, an episode of "Buffy," a track of the latest blink-182 album.

But this is changing. As a desperate media industry struggles to earn larger slices of a smaller advertising pie, it is willing to alter the content of its programming to include placement of key advertisers. And this isn't necessarily bad, either, if done appropriately. With the increase of software designed to filter ads from the Web, or PVRs that make fast forwarding through commercials so trivial, it is inevitable that this will happen more and more.

But does it really need to be this way? I don't think so. What advertisers desire is for more people to see their message. But what

they should desire is for the right people to see their message.

Some of this happens implicitly. If you read a tech Web site, you are likely to see ads for software, games, and computer parts. If you watch "Trading Spaces," you'll likely see ads for Lowe's or Home Depot. But this is still terribly non-targeted advertising. How many ads for herpes medication have been wasted on me? How many minutes of ads for feminine hygiene products? For diapers? What about car ads? I just bought a car—I won't be buying another for many years! The advertisers are wasting their money and my time. They have no choice but to saturate the market to find the small percentage of people interested in their particular product.

**TV exists
to give advertisers
your eyeballs.**

The goal is to show the right ad to the right people. If this is done, the viewers are happy because they learn about a product that they want, which results in a commercial transaction, which

makes the advertiser happy. The trade off is that we need to provide private information. What that information exactly is remains to be seen: age, gender, occupation, hobbies? How that information is used is equally tricky. TiVo could use the info to further target its advertising. A recent "Austin Powers" ad campaign provided entertaining and unique ads that actually worked. TiVo users used to fast forwarding through ads went out of their way to watch this ad.

The first place that this can happen is the Web. The company that cares for both the anonymity and privacy of its users, as well as the successful targeted placement of the advertisements of its clients, will finally make Web advertising work for real. And when this happens, I think we'll see a significant shift in the digital content that is available online. Hopefully by then the promise of broadband and multicasting will come to fruition, and true interactive media will sprout forth out of the Internet. And for once the content owners and advertisers won't have to kick and scream along the way. ■

Email me at malda@cpumag.com. I dare you.

Inside Info

AURORA WARNING: A solar wind shock wave swept past Earth on Sept. 7 at approximately 1630 UT (12:30 EST). The interplanetary magnetic field turned sharply south when the wave arrived, which means a geomagnetic storm is likely. . . .”

The opening narration for a cheesy late-night space thriller on the Sci-Fi channel perhaps? Nope. This is an actual space weather report snippet from Space Weather News (www.spaceweather.com), which arrived on my Desktop in one of about 30 email newsletters to which I subscribe. Many of them, like Space Weather, center around my geek interests, including NASA Science News (science.nasa.gov), John Latta's The WAVE Report on Digital Media (www.wave-report.com), and New Scientist (www.newscientist.com). Others are tied to work, such as Inside Gamasutra (gamasutra.com) and NVIDIA, ATI, and Matrox Graphics Developer Relations newsletters. Each is limited to developers, but they all provide online archives (developer.nvidia.com, www.ati.com/developer, developer.matrox.com). For mainstream news, I receive ABC News' Breaking News and Jennings' Journal (www.abcnews.go.com) but rely heavily on several online sites to which Google provides a permanent links page (www.google.com/news).

This may all seem rather excessive, but my theory is that the illness of our time isn't information overload; it's feeling like we don't get enough. That sinking sensation as we click from channel to channel and hear roughly the same few news stories repeated again and again; that we are not so much being informed as we are being numbed by repetition. So signing up for email newsletters is just part of my ongoing quest to knit together a more complete picture of what is really going on beyond my screen. Another part is reading, for want of a better term, news blogs.

Even inside the usual ratings/advertiser-driven news sources, which seem heck-bent on making spokesmodels rich and famous (why does no one aspire to be smart and funny?), the world of the blogger is actually having some impact. This is not Matt Drudge spilling beans about our Commander-in-Chief having it off with some intern; this is real-time citizen dialogue. After each news event,

press conference, commentary, and pundit analysis, the best (and worst) of the bloggers pull on their thinking caps and have at it. Each policy decision is dissected, each interpretation of events discussed, sometimes aided by real-life, in-the-trenches experts who respond with profound insight. The pieces assemble in real time, each point of the discussion honed smooth by challenge and debate. This is even better than being back in Ms. Tatum's eighth-grade science class where news was a living entity to be dissected and analyzed collectively. This is another place where the 'Net becomes so much more than the sum of its parts.

A good source of comprehensive information about any particular subject is a thinking, articulate someone who is focused on that subject. I read Steven Den Beste's USS Clueless site because he expends far more effort reading about and analyzing world events as they relate to the current war situa-

tion than I have the time (or stomach) to do. He funnels all that content as well as reader and fellow blogger feedback through a brain trained as an engineer, and he is up-front about his personal biases. I have come to think of him as an early

warning system, alerting me to issues I will want to watch closely for myself.

Oriented somewhere toward the more touchy-feely end of the spectrum is a site like Utne Reader (utne.com), where staffers have been reading, summarizing, and reprinting the best of alternative media sources for 18 years and have now moved onto the 'Net. Sitting on the fence and watching the whole barnyard are online versions of media watchdog entity the Columbia Journalism Review (www.cjr.org). No lightweights here. But back to pressing celestial events. . . .

“Sky watchers in New Zealand and southern Australia, where it was nighttime when the shock wave struck, have a good chance of seeing Southern Lights. Observers in northern Europe, and perhaps Canada and northern U.S. states, might see Northern lights after local nightfall on Saturday. Stay tuned to spaceweather.com for updates.” I love this stuff. ■

Spam your top newsletter link to
joan@cpumag.com

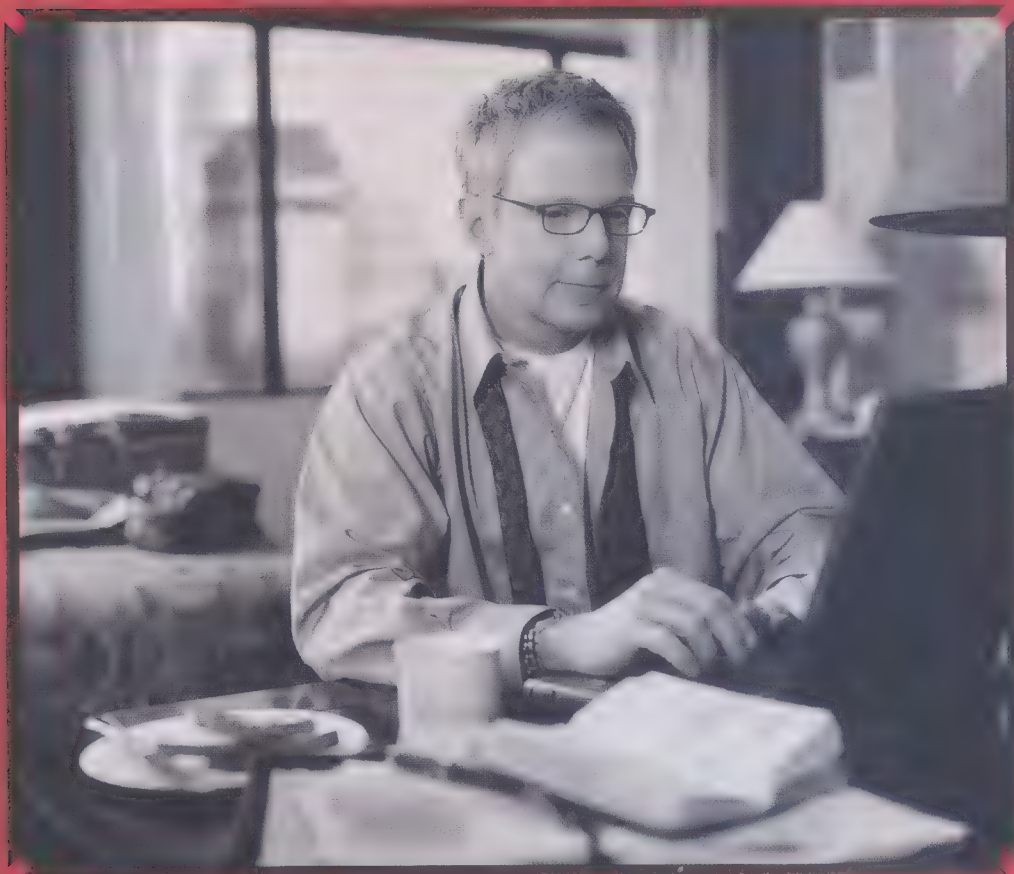


Starting as gopher for the Emmy-winning team that pioneered live in-car TV cameras for the Indy 500, Joan became an independent video/sound engineer, technical director, and producer. Playing with Reality Engines and motion platforms led to co-founding Xatrix Entertainment, where she produced the two Cyberia games. Before 3D acceleration was trendy, she formed Mango Grits to develop hardware-only game Barrage for Activision. Since cashing out from SharkyExtreme.com, where she was co-founder and managing editor, Joan has retired.



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Road Warrior

**1xRTT Toys, New Palm Security Tool,
Problems Counting Colors, New York's
Crusade Against Cell Phones & More From
The Mobile Front**

PiLock Security Case

Most of us keep fairly sensitive information on our PDAs: deadlines, appointments, contacts, financial information, and perhaps even sensitive corporate memos. If you lose your PDA, or worse yet, someone steals it, you suddenly find yourself with little control over who has access to your information.

If you have secrets on your Palm worth protecting, you can always password-protect your PDA. For Palm users who need another password to remember like Microsoft Outlook needs another security hole, Portable Innovation Technology Ltd. (www.pitech.com) has the solution. The PiLock uses a special leather case with a built-in RF receiver. Using the included PiSecure software, you can lock the system each time you turn it off. To unlock the system, you can use one of two included RF keys. One key is roughly credit card-sized and fits nicely in a wallet, and the other key attaches to a key ring.

Setup appears to be fairly simple: You install the PiSecure, place the PDA in its leather case, and wave the RF keys over the case to register the key. If you lose a key, you can order a replacement and register the replacement key to void the old key. A password provides a backup method for unlocking your Palm.

The leather case comes with a special USB cable and power adapter that let you charge and synchronize your Palm without removing it from the case. At press time, PiLock was set to retail for \$69.99.

CDMA Toys

In the past, all the cool toys have operated over GSM/GPRS networks, but with two CDMA 1xRTT networks now operational, we're beginning to see some pretty impressive CDMA gadgets.

Audiovox's Thera (\$784.99; www.audiovox.com) was released in mid-August for Verizon's Express Network. The Thera comes with a 206MHz Intel StrongARM processor, 64MB of RAM, an SD slot, and a 16-bit reflective TFT display. The Audiovox-branded version is available through Verizon Wireless, but Toshiba has its own version of the Thera listed as the Toshiba 2032 (\$799.99) that's available from Sprint PCS (www.sprintpcs.com).

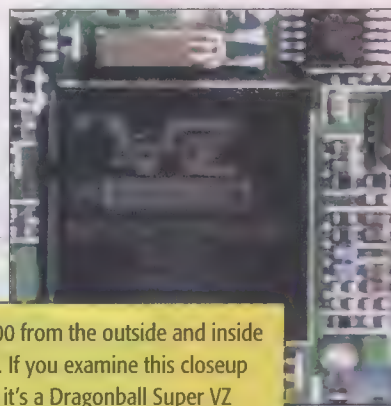
Samsung (www.samsung.com) also had a 1xRTT smartphone in the making as we went to press. Although Samsung had not made an official announcement at press time, details of the SPH-i500 were available via the FCC Web site (www.fcc.gov). Like its predecessor, the SPH-i300, the new smartphone runs the Palm OS, but its clamshell design is more reminiscent of a mobile phone than the SPH-i300's PDA-like design. Internal pictures of the SPH-i500 indicate that the device will use a 66MHz Dragonball Super VZ processor that we have previously only seen in the Sony CLIE T655C and NR70 series.

Sierra Wireless also has new 1xRTT peripherals. The AirCard 555 (\$299; www.sierrawireless.com) provides wireless data access via 1xRTT networks. Other phones, such as the LG VX1 from Verizon, can connect to a notebook via a data cable. The notebook can use the phone as a modem to establish a data connection over a 1xRTT network.

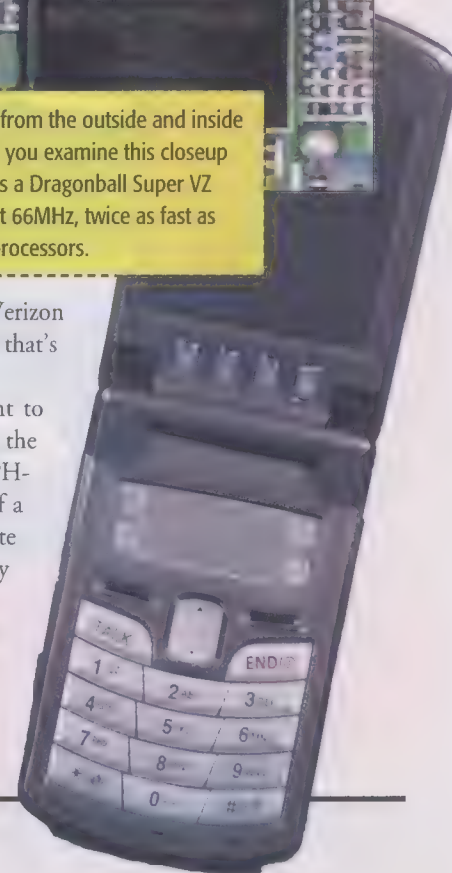
AvantGo Offers Expanded Channel Service

Today, everyone is looking for ways to generate revenue. For a time, AvantGo (www.avantgo.com) was toying with the idea of discontinuing custom user channels. Rather than paying AvantGo to make optimized content available to users, some Web sites were encouraging users to make free custom channels of their Web sites. AvantGo eventually backed away from the idea.

AvantGo's latest idea is infinitely better. The company is looking to offer a premium service providing 8MB worth of channels for \$19.95 a year. The company will continue to provide its free service, which is limited to 2MB worth of channels. This may be an attractive service for AvantGo addicts who have memory to spare while not affecting users of the free service.



The Samsung SPH-i500 from the outside and inside (courtesy of the FCC). If you examine this closeup of the chip, you'll see it's a Dragonball Super VZ processor, which runs at 66MHz, twice as fast as most current Palm OS processors.

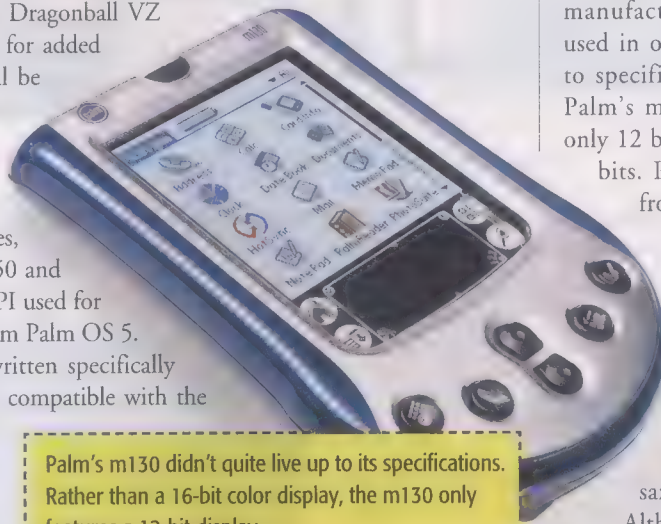


Acer's High-Res Color Palms

With a foot in both camps, Acer (global.acer.com) is one of the few PDA manufacturers to offer customers both Palm OS PDAs and Pocket PCs. The company is bringing two new Palm OS devices to the United States, the Acer s50 and Acer s60. Both models will feature a 320 x 320 TFT display (twice the resolution of most Palm OS displays), a 33MHz Dragonball VZ processor, and a Memory Stick slot for added storage. The Memory Stick slot will be compatible with hardware add-ons such as GPS and Bluetooth modules. The s60 will feature more compelling audio features, including MP3 playback, stereo headphones, and voice recording. Although the s50 and s60 are running Palm OS 4.1, the API used for the high-resolution display comes from Palm OS 5. This means high-res applications written specifically for Sony's CLIE models will not be compatible with the display on the s50 and s60, but it should be able to handle some higher applications written for OS 5.

Both models are expected in September. The s50 will sell for roughly \$300, and the s60 will sell for just \$60 more.

Palm's m130 didn't quite live up to its specifications. Rather than a 16-bit color display, the m130 only features a 12-bit display.



Palm m130 Pulls A Jornada 540

Color displays, as complex as they may be, aren't rocket science. Nonetheless, Palm has become the second PDA manufacturer to admit color displays used in one of its models don't live up to specifications. The color display in Palm's m130 model actually supports only 12 bits instead of the advertised 16 bits. Prior to the acknowledgement from Palm, the online specifications for the m130 billed the display as a "backlit, color screen with support for more than 65,000 colors." Palm has since changed the Web site to the more ambiguous "backlit, color display with support for thousands of colors."

Although 16-bit displays can support as many as 65,536 color combinations, 12-bit displays can only handle 4,096 color combinations. From our experience, the smaller color palette is mostly an issue when viewing images on a Palm, but it's tough to tell the difference between 12-bit and 16-bit color when using standard applications. By using dithering to combine nearby color pixels, the m130 can support more than the typical 4,096 colors. In fact, with dithering, the m130 can support more than 50,000

color combinations. Although not too far off, the fact remains that Palm should know its hardware better than it apparently does.

Hewlett-Packard ran into a similar problem with its Jornada 540 series some years ago. Although billed as having a 16-bit display, a part used in the color display limited it to just 12 bits.

Go Stand Outside With The Smokers

New York City may become as hospitable to cell phone users as California is to smokers. New York was the first city to ban cell phone use in cars, and now city councilman Philip Reed has introduced legislation that would make it illegal to use a cell phone at public performances. If your cell phone rings or you're caught talking on the phone at a movie or a play, you could be fined \$50 if the call is not an emergency. The law supposedly has widespread support.

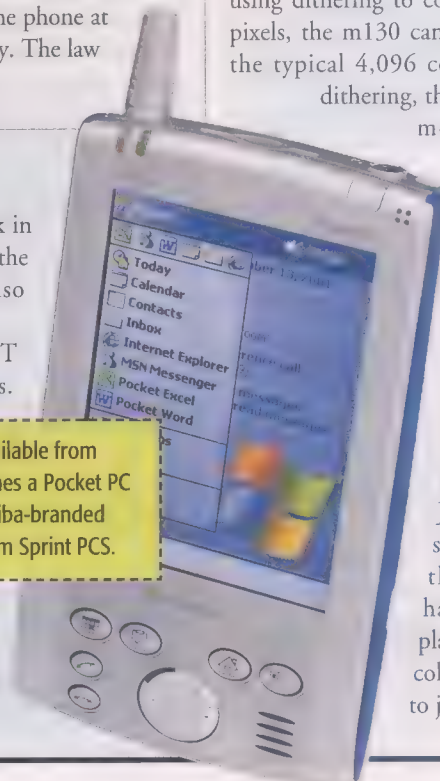
Sprint's Vision vs. Verizon's Express Network

Last month, we touched on the rollout of Sprint's 1xRTT network in conjunction with the release of the Handspring Treo 300. At roughly the same time, Verizon Wireless (www.verizonwireless.com) was also launching its Express Network in roughly 300 U.S. cities.

The Express Network, like Sprint's Vision network, uses 1xRTT technology that offers data speeds between 50 Kbps and 60Kbps. The 1xRTT networks lay the groundwork for eventual 3xRTT networks with data speeds projected faster than 1Mbps.

Verizon's Express Network is currently available in 300 locations, including Los Angeles, New York, and San Francisco. A \$99 unlimited use plan provides all the data you can handle (minus a few restrictions). Other plans range between \$35 and \$75 a month for 10MB to 40MB, respectively.

The Audiovox Thera is currently available from Verizon Wireless. The Thera combines a Pocket PC with a 1xRTT mobile phone. A Toshiba-branded version of the Thera is available from Sprint PCS.



At Your Leisure



Plug In, Sit Back & Fire Away

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest in PC entertainment, DVDs, consoles, and just stuff we love, read on.

The Thing Begin Where The Movie Ends

First things first: before you play this game, get into the mood by watching John Carpenter's "The Thing" on DVD. Go ahead; we'll wait. <tick tick tick tick . . . > OK, done? If your shorts are damp, go pick up some Depends. The rest of you can prepare yourself for an excellent survival horror action-adventure game. (No doubt the more impatient among you have already been to IMDB.com for a quick plot synopsis.)

Games based on movie licenses, as we all know, tend to be disappointing. The Thing surprised us by actually being a very worthy sequel to the movie. The game is played from the third-person perspective, but you can switch to a manual viewing mode for more personal combat. Oh, and yes, Antarctica is still bloody cold.

You (Captain Blake) are dropped at a destroyed Antarctica base along with a crew consisting of a medic, engineer, and soldier. At first, you'll feel hairs on the back of your neck rise, and then the game gets genuinely scary. There were moments where we literally jumped in fright. Not bad for a computer/video game. One aspect that leads to the tension is the in-game trust meter. As you well know, The Thing is actually a virus that can assimilate other creatures and take on their form. That mean you or your squad could conceivably be "things." As the game progresses, you'll need the expertise of your squad. However,

distrust on its members' parts will lead to individuals refusing to cooperate or even hostility if they believe you to be infected. You can improve the trust of your squad in

several ways. For example, you may arm an unarmed medic, heal an engineer, and so on. But can you really trust them?

Expletives and heavy blood flow can be found throughout, but both fit the subject material of the movie and game perfectly.



"We were on vegan diets, but what the hell! Grilled Thing is apparently quite tasty."

For example, infected humans literally explode, and the resulting gore-laden splatter is a site to behold. (Not to mention nearly having the living crap scared out of you.) If a good scare in horror movies and games fits your criteria, don't miss out

on Vivendi Universal's The Thing.

The Thing (PC, Xbox, PS2)

\$49.99

Vivendi Universal Games

www.thethinggames.com

Check These Out On The Web

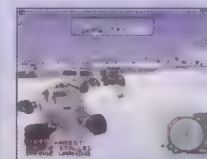
See our reviews of **NCAA College Football 2K3** (PS2, Xbox, NGC), **NFL2K3** (PS2, Xbox, NGC), **Hunter: The Reckoning** (Xbox), and **Smuggler's Run: Warzones** (NGC) at www.smartcomputing.com/cpumag/nov02/gamereviews.



Nebraska and Oklahoma square off in Sega's NCAA College Football 2K3.



Interplay's Hunter: The Reckoning features four-player mayhem using the classic Gauntlet concept.



Smuggle goods into international hot spots in Smuggler's Run: Warzones.



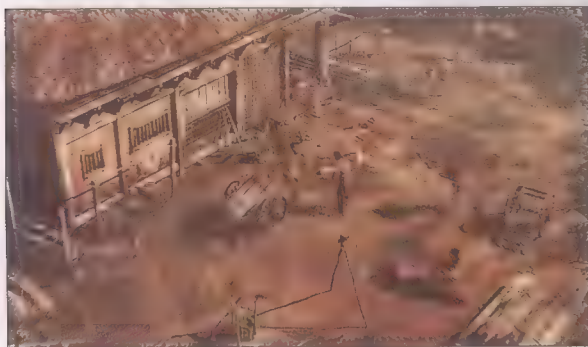
Ricky Williams hurdles Patriots linebacker Tedy Bruschi in Sega Sports' NFL 2K3.



Onimusha 2: Samurai's Destiny Fear & Loathing In Feudal Japan

If you liked Capcom's 2001 hit *Onimusha: Warlords* (reportedly the first PS2 title to sell more than 1 million copies), prepare to be bowled over by its successor. *Onimusha 2* has lots of the same, third-person action set in feudal Japan. The action takes place about 10 years after the first game's hero, a wandering

enslave all of Japan a few years later, and as the story in *Onimusha 2* begins, his henchmen raze the hometown of a samurai named Jubei Yagyu. This young swordsman, who is the head of his clan, comes home to find it in



The marauding forces of the underworld are about to ravage Jubei's peaceful home, Yagyu village.

samurai named Samanosuke, defeated Fortinbras, king of the demon clan, in single combat.

The evil warlord Nobunaga went on to replace Fortinbras as the leader of the dark forces of the underworld. Nobunaga sent his undead troops on a campaign to

ruins and, as you might imagine, is none too happy. Jubei swears revenge on Nobunaga and his demon pals and sets off on a quest to chop them all into itty-bitty pieces.

The control scheme in *Onimusha 2* is nearly identical to that of its predecessor, including Jubei's ability to absorb the mystical soul energy of vanquished foes. As in the

first game, you start out armed with a traditional samurai sword but over the course of the game obtain an impressive lineup of magical weapons that give Jubei the ability to call upon the elements in battle.

The biggest difference between the two games is that while in *Onimusha* you got



Nobunaga Oda's undead soldiers are an unsavory lot.

help from one secondary character (a female ninja known as Kaede), you'll get to interact with and control several in *Onimusha 2*. Which characters you play with (and play as) in some scenes depends on Jubei's degree of friendship with each of them, a factor you can influence through the game's gift feature. Throughout the game, you'll come across a wide array of items that are cool but appear at first to have no practical purpose. Although you can't equip or use many of them, you can give them as gifts to the four secondary characters. The trick is giving the right gifts to the right characters, making them happy, and getting the items and



Jubei does battle with one of the *Onimusha 2*'s huge, nasty bosses.

DVD Byte by Todd Doogan

Forget "Shrek;" the best computer animated film of 2001 was "Monsters, Inc.," and this new DVD from Pixar and Disney shows us exactly why. Not only does this two-disc set give us a flawless video and sound presentation (in both anamorphic and full frame), but we also get a thorough look behind the scenes on just how much love and work went into bringing these scary creatures to

life. Find out how two separate cutting edge rendering tools were exclusively developed to animate the hair and



clothes with little effort on the artists. And when you look at the different phases of development you'll see how far they came in getting the incredible look of this film. And for the kids, there's also a separate section of the DVD full of games, character profiles, and read-alongs. Fans of CGI should check this out; it's so good it's scary.

assistance from them that you need. This is a great twist, and playing as multiple characters provides plenty of variety.

Aside from a bit of predictably silly voice acting (which has become part of the fun for hardcore Capcom fans) and some slight camera angle quirks, *Onimusha 2* doesn't really have any flaws. As usual, Capcom delivers some of the best cinematic interludes in the business, and we enjoyed playing the game from start to finish.

Onimusha 2: Samurai's Destiny (PS2)

\$49.99

Capcom

www.capcom.com



Turok: Evolution Laugh, Cry & Waste Monkeys

Turok: Evolution is a prequel of sorts for the Turok series, which began in 1997 with the release of Turok: Dinosaur Hunter. It's 1886, and the Saquin warrior Tal'Set is locked in a life-and-death battle with the ruthless Captain Bruckner of the U.S. Army, a man on a mission to wipe out the remnants of Tal'Set's tribe. Blood from Tal'Set's wounds triggers a supernatural gateway that flings him into a strange world known as the Lost Land, where survival of the fittest is a way of life.

Tal'Set soon finds that it's his destiny to take up the mantle of Turok and the battle against the evil lord Tyrannus' bloodthirsty Sleg (humanoid reptile) troops. As the game begins, you find yourself in a mountain forest surrounded by hostile creatures and enemy troops. Armed with a bow and a war club, you set out to right some wrongs, picking up an impressive arsenal of weaponry along the way.



Turok: Evolution's vast, outdoor environments are reminiscent of "Jurassic Park."

Turok: Evolution features the familiar, two-stick analog controls that by now most console gamers have mastered, so it's easy to jump in and get started right away. The game's lush forests, foreboding mountains and roaring waterfalls provide a captivating backdrop in which to play, and Acclaim gave Turok's world an impressive amount of interactivity. You can shoot anything that moves, from frogs and birds to gazelles and monkeys. Bushes sway as you walk through them, and you can even knock down the game's trees—onto hostile critters if you're precise.

You'll face a menagerie of dangerous wildlife (crows, baboons, velociraptors, t-rexes, and more) in addition to an impressive array of enemy troops, which range from stupid, poorly armed grunts to wily, artillery-packing soldiers and massive, deadly bosses.

It's easy enough to walk up ladders and climb vines, but when we tried to go back down them, we frequently fell and sustained damage. The good news is that this is really the only flaw we came across. Enemy AI is pretty good; Tyrannus' troops will gang up on you, fall back if they're outmatched, take cover, and fire on the run to avoid your attacks. Combine this with the game's incredible wild and industrial environments and a few pretty decent flight levels (in a few areas, you'll hop on a winged Quetzalcoatlus equipped with machine guns and a rocket launcher), and you've got all the makings of a top-shelf FPS.

Turok: Evolution (PS2, Xbox, NGC)

\$49.99

Acclaim

www.turok.com

Dead To Rights Way Beyond Max Payne

Dead To Rights is the advanced evolution of the gameplay style pioneered by Max Payne (console review in April 2002 issue). As ex-cop Jack Slate, you're out to avenge the death of your father. Along the way, you find the game's plot and storyline are as simple as your household Hong



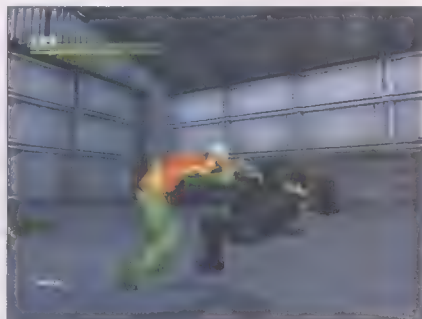
Yo bad guys, don't mistake these arms wide open for a hug. Jack's serving up bullet lurve.

Kong kung-fu detective thriller with a hard-boiled body count to match.

Unlike The Thing (also featured in this section), Dead To Rights showcases stylized violence for all 15 chapters of the game. But there's a lot more to the action than Max Payne's repetitive Bullet Time mode. You can jump into a slow motion combat mode, disarm (and kill) bad guys in numerous ways, use bad guys as body shields, perform hand-to-hand combat, and call in Shadow, your canine sidekick.

The cutscenes progress the storyline while the gameplay itself is pure action. All this stylized action gives Dead To Rights what almost seems to be an arcadish feel. Along the way you'll encounter numerous minigames of varying quality that gives the game a nice change of pace. Dead To Rights is quite challenging and filled to the brim with adult themes. Some of the gratuity in

cutscenes or minigames overstay their welcome, but this is not enough to detract from the action noir that embodies Namco's



You can use dozens of moves to disarm your opponents. Here we see Jack wiping his shoes.

Dead To Rights. Be warned: You'll definitely want to send the kids to bed before you get down and dirty in the shoes of Jack Slate.

Dead To Rights (Xbox)

\$49.99

Namco

www.deadtorigths.com

Hot Shots: The Beauty Of The Game

Yeah, we know it's all about the gameplay. Sure, there are those who would have you believe graphics are relatively unimportant in the greater scope of things, but if you read *CPU* mag, you probably already know those folks are off their collective rockers. We want great gameplay combined with stunning graphics, and here are two upcoming games that show promise. Watch for them.



Infinite Loop

Yahoo's Seven Dirty Words

Pssst! Hey, did you know there are certain words you're not allowed to send to Yahoo! email users? These seven dirty words are: eval, expression, mocha, javascript, jscript, vbscript, and livescript. (We never said they were as juicy as Carlin's seven dirty words.)

These subversive words can be used in certain network attacks, so Yahoo! decided it should replace these dirty words without informing its users or bothering to check for word boundaries. The terms ending in "script" are simply hyphenated (jscript becomes j-script). Other terms are replaced. Mocha becomes espresso, expression becomes statement, and, most notoriously, eval becomes review. This leads to such beauties as reviewuote.

Some terms are beginning to seep into common usage. The term "medireview" is the most famous filter spawn. A September Google search showed 120 pages ending in .edu referenced the Frankensteinian term. Some bibliographies are even being changed. The Curriculum Vitae of Northwestern University that professor Robert E. Lerner posted at Fordham University (www.fordham.edu/GSAS/Reform/Lerner.pdf) includes a listing for an article titled "Medireview Prophecy and Religious Dissent." The correct title of Professor Lerner's article is, of course, "Medieval Prophecy and Religious Dissent." Looks like college students aren't the only ones plagiarizing from the Web.

plagiarizing from the Web.

~~mocha~~

SOFTWARE TIPS & PROJECTS

The Big Lockdown

LOYAL *CPU* MAGAZINE READERS MAY HAVE BEEN GOOD AND SCARED AFTER READING LAST MONTH'S SPOTLIGHT SECTION ON THE PREVALENCE OF HACK

attacks and the many, many openings a common PC can offer an intruder. As more of us connect to the Internet via always-on, high-speed connections and at the same time deploy home networks, it is quite possible that you have unwittingly let a hacker come in and set up shop as a stealth member of the network. Don't panic. Although most security experts will tell you that there is no such thing as a hack-proof system, most malicious PC intruders are easily deterred.

Here are some of the quick and painless countermeasures any PC user can take to keep hackers at bay. In addition to reiterating the basics of PC security, we will cover the most effective ways of stopping

up the two major vulnerabilities of your PC while online: hackers using your Web connection to access your internal network from the outside and ports that your programs open from the inside that let hackers gain entry.

Hack Thyself

If your high-speed connection sits behind an Internet gateway or router, you may have more protection already in place than you think. The first step is diagnostic. Companies often hire "white hat hackers" to perform security audits of their systems, essentially to hack the networks to identify weaknesses. For the rest of us, there is Steve Gibson's indispensable Shields Up! service at the Gibson Research Corporation Web site (www.grc.com), which scans your PC from the Web and tells you what a hacker might see.

The Shields Up! service can scan your PC directly from the Gibson site with two tests: The Shield check determines whether and how your computer is visible from the Web and then it tries to access your network. This is the route by which hackers can peer into your network, rob and pillage material, or start planting

programs. The Ports test scans the most commonly hacked ports to see if they are open and vulnerable. There are more than 65,000 ports on a PC, each dedicated to different types of input/output activity such as HTTP (Web) or FTP (file downloads) transfers, and hackers can exploit them to plant Trojans and hijack your machine, especially when the easier entry points are secure.

If you access the Web via a router, it is likely that this Web page will report that your PC is in stealth mode and essentially invisible to the Web. Otherwise, it could give you some clues about where weaknesses lie. For instance, if the Shields test can find your home network, you may need to go to our next stage, tweaking

Your computer at IP:
68.82.192.178

Is being 'NanoProbed'. Please stand by...

Total elapsed testing time: 3.991 seconds
(See 'NanoProbe' box below.)

Port	Service	Status	Security Implications
21	FTP	Stealth!	There is NO EVIDENCE WHATSOEVER that a port (or even any computer) exists at this IP address!
23	Telnet	Stealth!	There is NO EVIDENCE WHATSOEVER that a port (or even any computer) exists at this IP address!
25	SMTP	Stealth!	There is NO EVIDENCE WHATSOEVER that a port (or even any computer) exists at this IP address!
79	Finger	Stealth!	There is NO EVIDENCE WHATSOEVER that a port (or even any computer) exists at this IP address!
110	POP3	Stealth!	There is NO EVIDENCE WHATSOEVER that a port (or even any computer) exists at this IP address!

A PC has tens of thousands of ports through which a hacker can penetrate a system. Here, the Shields Up! utility at www.grc.com scans our PC directly from the Web and tests the most common ports that are left open to communicate with the Web.

Registry Tweak

Folder Flexibility

If you relocate or copy Windows folders from drive to drive or even across a network, you will appreciate having the Move To and Copy To commands just a right-click away. You can add these commands to the context menu for folders with the following Registry tweak, which works in all Windows versions. Using the Registry Editor, find `HKEY_CLASSES_ROOT\DIRECTORY\SHELLEX\CONTEXTMENU\HANDLERS`. To add a Move To Folder command, add a new subkey to this highlighted key in the left pane and name it Move To. Double-click the Default value name and type `{C2FBB631-2971-11d1-A18C-00C04FD75D13}` (brackets included) in the Value Data field. For the Copy To Folder command, make another subkey and name it Copy To. Type `{C2FBB630-2971-11d1-A18C-00C04FD75D13}` in the Value Data field. The changes should be immediate. Right-click a folder in an Explorer menu to see both commands. ▲

your file sharing and networking settings. If ports are open and visible to the Web, you need a firewall.

THE TIME THAT MATTERS

One key to personal PC security is keeping your internal LAN and your Internet connection separate, even though by default Windows slaps them together and so leaves your PC open to easy hacking. It is likely that when installing the network drivers for connecting to the Internet, Windows also bound your TCP/IP connection to Windows networking. This unnecessarily links your Web connection and your internal network, in effect making your LAN visible and perhaps usable from the Web. Windows networking "binds" the various protocols for networking and Internet connections together, and you need to unbind them.

First and foremost, every expert recommends disabling File and Printer Sharing if you don't really need this feature. The quickest way to do this is to right-click the drive or folder that is shared (usually the drive or folder icon includes the image of a hand) and uncheck the sharing option in the Share tab.

No connection. If you have a standalone machine or don't want shared access among the machines on your home network, the safest route is to uninstall the sharing driver altogether and unbind TCP/IP from Microsoft Networking. In Win98/Me's Control Panel, double-click the Network icon to open the Properties dialog box. In the Configuration tab, highlight File And Printer Sharing and click Remove.

You're not done, however. Click the TCP/IP protocol in this same window. You want the one that is tied to the NIC that accesses the Internet. Then click Properties and go to the Bindings tab. Remove the check mark from the Client For Microsoft Networks checkbox. In fact, Steve Gibson recommends that you go into every instance of the TCP/IP protocol for every adaptor in the network configuration box and unbind it from file sharing and the MS networking client in order to stop all possible leaks. This unbinds your Internet link from the internal network. Windows will issue a warning that you

WinXP Tip Of The Month

XP's Super Secret Support Tools

The Windows XP installation CD is the gift that keeps on giving. If you followed our advice in previous months, you discovered the Recovery Console, a command line rescue utility that you access by booting from the XP CD or manually installing it onto your hard drive. In yet another rarely visited subfolder of the CD, we find

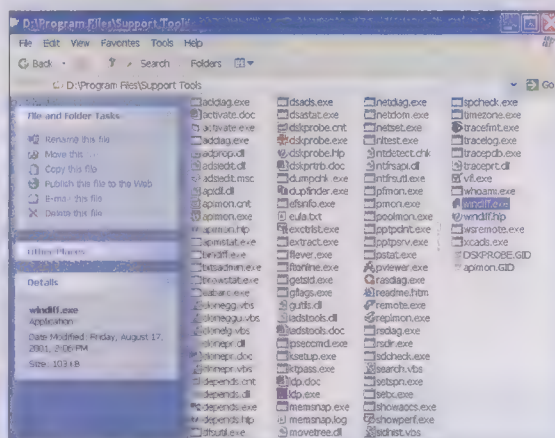
the Windows Support Tools. This trove contains scores of high-level diagnostic and repair tools, which is why they are not installed by default or even discussed much in the documentation or third-party books. Fair warning: These programs explore the minutiae of your system operations, files, and disk partitions and are not for

the faint of heart. Some can damage your system if you use them improperly.

Caveats, shmaveats! How often does Microsoft give you something for free, anyway? You can install these puppies by clicking the Support folder on the WinXP CD and then clicking its Tools subfolder. Use Setup.exe in this folder to do a complete installation of nearly 100 tools.

The Windows executables have their own Help files while all the command line programs are explained in the Support Tools help file.

OK, we have to warn you about one program in particular. The Disk Probe (dskprobe.exe) can edit otherwise inaccessible sectors of your hard drive, including partition information and master boot files. Stay away. This can do much damage.



Here are more of XP's hidden goodies. The Support Tools are dozens of advanced Windows-based and command line programs that can diagnose PC problems at a low level.

haven't bound this protocol to any drivers, which is exactly what we want, so click No to close the window. This will require a reboot to take effect.

In WinXP, you can unbind the TCP/IP protocol from the LAN by double-clicking the Network Connections icon in the Control Panel. Click the relevant connection and choose Advanced Settings from the Advanced menu. In the Adapters And Bindings tab, you can see the network and file sharing bound to the TCP/IP protocol. Uncheck both. In WinXP, this change can be made on the fly and without a reboot. WinXP does not support the NetBEUI protocol, which is used in the next tip.

Connected but secure. If you want to maintain the file-sharing capabilities of a home LAN using Win98/Me but still keep it separate from the Internet connection, you will want to keep the File and Printer Sharing protocol installed but still follow the procedure above for unbinding the TCP/IP protocol from both sharing and the Client For Microsoft Networks. We will use the NetBEUI protocol for the internal network. Click Control Panel, Network. In the Network dialog box, click Add and choose Protocol. Then click add again and select Microsoft and NetBEUI. Click OK. Now, the NetBEUI protocol will appear in the Network dialog box. Highlight NetBEUI and click Properties to

see that it is bound to File Sharing and the MS Networks client. You should now be good to go.

Router/gateway users may need to keep their TCP/IP bound to the MS network and File and Printer Sharing because these devices often use that protocol to interconnect the machines on a home network. Luckily in these cases, your router is serving as a fairly effective firewall, keeping your internal network hidden from the outside world. Still, for an even better layer of protection, you will want to use a personal firewall for your PC. The above approach probably works best if you have two NICs in your PC, one for the high-speed Internet connection (this is the one that should be unbound from the LAN) and another for the internal LAN. Playing with networking protocols in Windows is deservedly notorious, so your own setup may require tweaking. The most exhaustive outline we have seen of unbinding TCP/IP from the internal LAN is at the Gibson Research Corporation site.

Lockdown The Firewall

A personal firewall is designed to lock down the thousands of ports on a PC, but

it is only as good as its configuration. Even if you do have a router/gateway protecting your internal LAN from external hacks, a personal firewall also protects you from the enemy within: Trojan programs that may try to open a path from your machine and its ports to the outside world. There are many commercial firewalls available, but one of the most popular is the free-ware version of ZoneAlarm. We used version 3.1 for this example.

The key area to check and configure in ZoneAlarm is the permissions it grants a program to act as a server. Letting a program such as an instant messaging client or a browser act as a server essentially keeps a port on your PC open and amenable to outside connections. This is a favorite port of entry to hackers. In the ZoneAlarm main screen, use the Programs button to show which Windows operations are communicating with the Internet. Check the Allow Server column on each program to see whether server access has been enabled and if so, use the context menu on that listing either to disable sever permission altogether or force it to ask you before the program establishes itself as a server.

Follow The Scripts

As routers and firewalls succeed in closing down common port access to a PC, hackers focus on the ports that PC users need and want to keep open in order to access the Internet. So more and more attacks originate in scripts embedded in email or even in Web pages. Unfortunately, running such scripts is considered a helpful feature in browsers and email clients, especially Outlook, so to fully lock down a PC, you have to manually adjust the security settings of these programs.

Both IE and Outlook use a similar scheme for adjusting security by Zones for general Internet, intranet, trusted sites, and restricted sites. In Internet Explorer, for instance, choose Internet Options from the Tools menu and click the Security tab in the Internet Options dialog box. Highlight the content zone

Lockdown Essentials Checklist

Let's review the basics for maintaining PC security that every expert gives but so few of us take:

- ✓ Install all updates and patches for your OS and especially for all client programs that access the Internet, including email, browser, instant messaging, newsreader, FTP, virus checkers, and your firewall. Heightened concern about security among all responsible vendors has led to a new mentality about upgrades. Regular patch releases that address newfound security holes are now standard in the industry, and users should make a routine of checking for updates.
- ✓ Password-protect everything. "Default" is the sweetest username a PC can give a hacker, and most people don't use the built-in protection their PCs have. For the PC itself, password-protect the logon for the OS and eliminate any "Guest accounts" that let users log on anonymously. Both the home router/gateway and wireless network cards are wide open to intruders in default modes. Change the "admin" username, add a password to the router, assign your wireless network a unique SSID, and turn the encryption option on.
- ✓ Remember to turn on the email monitoring function in your virus checker to block Trojan programs that surreptitiously try to open ports on your PC and establish links to the hacker that he can exploit.

for which you want to adjust the security and click Custom Level. The areas that you'll want to give special attention are ActiveX, Microsoft VM, and Scripting. You can set these areas to Prompt rather than Enable to make IE ask your permission before running these scripts. **CPU**

by Steve Smith

Infinite Loop

Vending Machine's Big Brother

Convenience shopping just got a little more convenient. Residents of the Adams Morgan neighborhood in Washington, D.C. can shop for necessities or even a late-night meal without wandering through the aisles of a store. The Tik Tok Easy Shop (or Shop 2000 as it is called by its manufacturer; let's hope the food items aren't as outdated as the name) is a fully automated vending machine about the size of a deli. Select your items on a touch-screen, insert the appropriate cash or use your credit card, and the Easy Shop will retrieve your selection from its storage area. The Easy Shop then sends data concerning its inventory and sales to its owner (McDonald's) via modem. Japan and Europe have also opened similar fully automated convenience stores.



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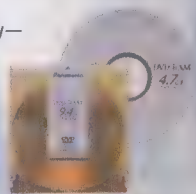
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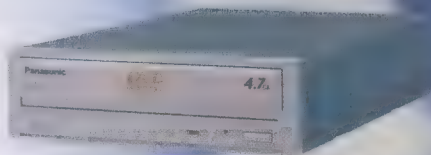
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WARM UP TO PENGUINS

Start & Stop Programs Automatically, Part I

IN OCTOBER'S ISSUE OF *COMPUTER POWER USER*, WE PRESENTED TIPS FOR HANDLING NETWORK TRAFFIC. THIS MONTH, AND IN MONTHS TO COME, WE DELVE INTO MORE

Linux issues and projects. This month, we focus on starting and stopping programs automatically.

You rarely reboot or shut down your Linux boxes. When you do, it sometimes takes awhile to realize you forgot to start a few system programs you usually run in the background. Or, you may have specific apps you want to run while you're in full GUI mode that you don't want lurking in the background when you're in full command line mode.

Taking care of such issues manually is a big pain. Not only is it annoying, it's unnecessary. In this two-part series of articles, we'll look at the major methods available for controlling which programs start automatically and when they start. Next month, we'll look in more detail at exactly how to accomplish this.

Controlling this portion of your Linux setup is one area where there's many techniques you can use, depending primarily on the distribution you're using. For a good cross section of methods, we'll specifically cover the following Linux distros: Debian GNU/Linux, Caldera Linux, Gentoo

Linux, Mandrake Linux, Red Hat Linux, and SuSE Linux. (Note that Caldera was recently renamed to The SCO Group.)

In general, there are two mechanisms for automating program startup for a

Linux machine. If you've read about Linux sysadmin issues, you've probably encountered both methods in reference to "the rc files." Exactly which files these are depend on which distribution you're using, but before you can track them down, there are some underlying Linux issues you'll need to understand.

The Rundown On Runlevels

One mechanism for controlling the programs that start and stop when your machine enters and exits a particular state involves the runlevel. The state in question

the same labels for their runlevels, so you'll have a bit of homework to do for your particular setup.

One of the first files the Linux kernel consults when your system boots up is called `inittab` (usually `/etc/inittab`, but not always). At the beginning of this file, you'll usually find a section that looks like the following:

```
# Default runlevel. The runlevels used
by RHS are:
# 0 - halt (Do NOT set initdefault to
this)
# 1 - Single user mode
# 2 - Multiuser, without NFS (The
same as 3, if you do not have networking)
# 3 - Full multiuser mode
# 4 - unused
# 5 - X11
# 6 - reboot (Do NOT set initdefault
to this)
#
id:5:initdefault:
```

The section with the lines that start with `#` gives you the definitions that this particular distribution, Red Hat Linux, uses for its particular runlevel setup. Now look to the line that is not commented out: `id:5:initdefault:`

The item after `id:` is the runlevel that this system boots into. In this case, that's runlevel 5, which means this Linux box boots directly into the GUI, offering the user a graphical login prompt. While the system boots, it looks for the various programs that are associated with this particular

runlevel. Some of the instructions will tell the system to make sure a particular program isn't running, and others will tell it to start a particular service. (We'll take a closer look at some of these later.)

```
root@localhost: /etc/rc.d/rc3.d
File Edit View Terminal Go Help
[root@localhost rc3.d]# ls -la | more
total 8
drwxr-xr-x 2 root root 4096 Aug 20 00:46
drwxr-xr-x 10 root root 4096 Aug 19 16:43
lrwxrwxrwx 1 root root 19 Aug 19 16:43 K09ssslauthd -> /init/d/ssslauthd
lrwxrwxrwx 1 root root 15 Aug 19 16:43 K15httpd -> /init/d/httpd
lrwxrwxrwx 1 root root 13 Aug 19 16:48 K20nfs -> /init/d/nfs
lrwxrwxrwx 1 root root 14 Aug 19 16:45 K24irda -> /init/d/irda
lrwxrwxrwx 1 root root 17 Aug 19 17:15 K35winbind -> /init/d/winbind
lrwxrwxrwx 1 root root 15 Aug 19 18:52 K45named -> /init/d/named
lrwxrwxrwx 1 root root 15 Aug 19 16:46 K50snmpd -> /init/d/snmpd
lrwxrwxrwx 1 root root 19 Aug 19 16:46 K50snmptrapd -> /init/d/snmptrapd
lrwxrwxrwx 1 root root 14 Aug 19 16:42 K74nptd -> /init/d/nptd
lrwxrwxrwx 1 root root 19 Aug 20 00:46 K95firstboot -> /init/d/firstboot
lrwxrwxrwx 1 root root 15 Aug 19 16:46 K95kudzu -> /init/d/kudzu
lrwxrwxrwx 1 root root 18 Aug 19 16:47 K98iptables -> /init/d/iptables
lrwxrwxrwx 1 root root 14 Aug 19 16:45 K98iscn -> /init/d/iscn
lrwxrwxrwx 1 root root 17 Aug 19 16:43 K98network -> /init/d/network
lrwxrwxrwx 1 root root 16 Aug 19 16:42 K12syslog -> /init/d/syslog
lrwxrwxrwx 1 root root 17 Aug 19 16:44 K13portmap -> /init/d/portmap
lrwxrwxrwx 1 root root 17 Aug 19 16:48 K14nfslock -> /init/d/nfslock
lrwxrwxrwx 1 root root 18 Aug 19 16:46 K17keytable -> /init/d/keytable
lrwxrwxrwx 1 root root 16 Aug 19 16:43 K20random -> /init/d/random
More
```

This illustration shows a long format file listing for `/etc/rc.d/rc3.d` in Red Hat Linux. You can see such an entry by typing `ls -la` at the command line.

here refers to features that are activated, such as the GUI, networking, and logging into various user accounts. Each runlevel has its own collection of features. However, not all Linux distributions use

Rather than give a complex set of rules for how to track down your runlevel start-up directories and files, we'll start by giving you a list of some for the more popular Linux distributions. Keep in mind that you can usually find this information in your distribution's documentation if you can't find it in the `initab` file:

- Debian GNU/Linux—do not edit directly; use the `update-rc.d` tool
- Caldera Linux—`/etc/rc.d/rc#.d`
- Gentoo Linux—do not edit directly; use the `rc-update` tool
- Mandrake Linux—`/etc/rc.d/rc#.d`
- Red Hat Linux—`/etc/rc.d/rc#.d`
- SuSE Linux—`/etc/init.d/rc#.d`

In each case where you see a #, substitute the runlevel code, such as 0 for a Red Hat shutdown.

Notice that there are two distributions (of those distros we're covering here) that work differently from the others. Debian GNU/Linux doesn't utilize the same runlevel numbers listed above. For example, you'd use runlevel 2 in Debian to boot into a fully operational command line interface rather than runlevel 3, which you would use in most Linux setups. Also, Gentoo Linux (a distribution primarily aimed at software developers) has a completely different approach to runlevels than other distributions. See www.gentoo.org/doc/rc-scripts.html for more information if you're using Gentoo.

The Final Startup Routine

Another mechanism for controlling what processes run at boot time is typically known as the file `rc.local`. This file contains the last set of programs and settings that should be put into action as your Linux machine finishes booting. As usual, though, things aren't quite that simple. Where you find this file (if there is one at all) depends on your distribution:

- Debian GNU/Linux—use the `update-rc.d`; see (www.debian.org/doc/FAQ/ch-customizing.html)
- Caldera Linux—`/etc/rc.d/rc.local`
- Gentoo Linux—`/etc/conf.d/local.start` and `/etc/conf.d/local.stop`; see www.gentoo.org/doc/rc-scripts.html
- Mandrake Linux—`/etc/rc.d/rc.local`

Linux Standard Base

There's an ugly rumor circulating that at any minute, the Linux community is going to fragment into a billion pieces. That may be an exaggeration, but so is the rumor. The reason given for possible fragmentation is that Linux distributions are more and more going their own ways. Not only do such rumors ignore such joint ventures as UnitedLinux (www.unitedlinux.com), but they also ignore another, perhaps much more important, point: The Linux Standard Base (www.linuxbase.org) project has been working to bring distributions together so programmers will find it easier to write software that covers multiple distributions. Most major distributions are involved with this project, and the first round of certified distributions were announced in early August, including Mandrake Linux, Red Hat Linux, and SuSE Linux. With these major players already on board, it's likely more will follow.

- Red Hat Linux—`/etc/rc.local` linked to `/etc/rc.d/rc.local`
- SuSE Linux—`/etc/rc.config` and then run `/sbin/SuSEconfig` or run `yast2` to let this program edit the file and avoid opening it manually

Some people just put everything in the file instead of bothering with the runlevel items. This isn't a very elegant solution, but if you don't tend to change runlevels while the machine is up, it's a viable solution.

Examine Runlevel Control Directories

In general, you'll use the `rc#.d` directories for programs that need to start at boot time and continue to run until you shut the machine off or change runlevels (type `man init` at the command line for more on how to do this). The `rc.local` file is typically used for starting shorter routines, something that will just run and then stop on its own, such as setting system-wide environment variables.

From here, we'll only discuss specifics for the distributions that use both the `rc#.d` directories and `rc.local`, specifically Caldera, Mandrake, Red Hat, and others. If you're using Debian, Gentoo, or SuSE, you'll find that some of this information will apply to your situation, and some will not. See your documentation for more instructions.

If you type `ls -la` at the command line from within one of the `rc#.d` directories, you'll see that the file listing isn't straightforward. For example, you might see something like the following two entries

(a longer version is shown in the illustration that accompanies this article):

```
lrwxrwxrwx 1 root root 19
Aug 19 16:43 K05saslauthd ->
../init.d/saslauthd
lrwxrwxrwx 1 root root 15
Aug 19 16:43 K15httpd -> ../init.d/httpd
```

The `l` that starts the first entry for both lines tells you that each of these items is a link. In-depth coverage of links is beyond the scope of this article. If you're unfamiliar with the term, a link is similar to a program shortcut. The key issue here is that if you look toward the end of the line, you'll see the link's name and the actual file the link points to.

In the example above, on the first line, the link (or shortcut) is `K05saslauthd` and the original file is `../init.d/saslauthd`. This is given as a relative path instead of an absolute. So, if we're looking at `/etc/rc.d/rc3.d/K05saslauthd`, the other file is located in `/etc/rc.d/init.d/saslauthd`.

What you'll find is that every file in the `rc#.d` directories is a link to a file in a central directory. This setup is used so that you're not duplicating the same files all over for various runlevels. It also ensures that it's easy to make changes to the central routines without having to do much in the runlevel directories, as well.

In Part II of this series, we'll look at the files within the runlevel control directories. We'll also look at `rc.local` in more depth and how to use all of this knowledge to your best advantage. **CPU**

by Dee-Ann LeBlanc

KILLER HARDWARE TIPS

Too Cool To Follow Rules

IF YOU'RE A USER WHO CAN'T LEAVE THINGS ALONE IF THERE'S A CHANCE YOU CAN MAKE THEM BETTER, EVEN IF IT MEANS BUCKING THE NORM, READ ON. WE HAVE SOME TIPS

and tricks that just might make you more productive.

Big Screen, Little Screen

Most power users would agree that the more information your PC can display, the better. Most would also agree that a second display, an LCD, would be a perfect addition to their computers. But LCDs are expensive, and your desk may not have the space or ability to withstand the weight of a second monitor.

However, you can surely find a few square inches for an LCD that's small enough to mount in a drive bay or set atop your monitor to provide a supplemental display area where your PC can show vital stats or personal messages.

Such displays typically connect to a PC's serial port, so you don't need a second video card. What can you do with it? Let's be frank: Regardless of how useful it is, installing a display in a spare drive bay can be the quintessential cool hack.

Cool factor aside, hardware enthusiasts can use a serial LCD to view temp and voltage stats of their PC's components. MP3 lovers can view the current tune playing. Network gamers can display game-server stats. Financial mavens can create their own tiny stock ticker.

If you already have a huge monitor, displaying a few more characters may seem silly, but "it's got a lot of wow factor," says Brent Crosby, president of display maker Crystalfontz (www.crystalfontz.com). Crystalfontz sells several serial LCD

versions, with plenty of customization options. One version fits in a standard CD-ROM-sized bay and has a 16-character x two-line display. There's also a two-bay version with a 20-character x four-line display. The displays are monochrome but are available in various colors.

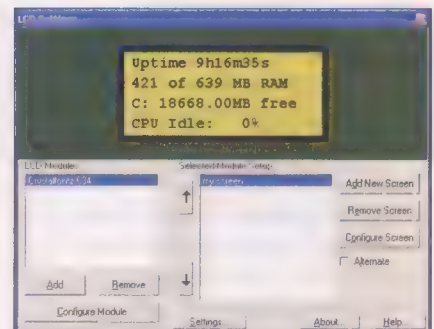
Matrix Orbital (www.matrixorbital.com) and Scott Edwards Electronics (www.seetron.com) also make LCDs, as well as VFDs (vacuum fluorescent displays). VFDs are brighter than LCDs and are easier to read at a distance, but they draw more power and tend to be more expensive.



A bay-mounted display is so cool that your friends might not make fun of you for having a 33MHz PC. But don't bet on it.

Prices can range from about \$35 to \$150 for LCDs and from about \$95 to \$140 for VFDs.

We tried the Crystalfontz 634, an elegant 20-character x four-line backlit



CrystalControl software lets you customize the output of a serial LCD display, even importing information from Winamp, Motherboard Monitor, and other programs.

display. Connection was easy. We simply mounted the display in a drive bay and connected the display's power and serial connectors. (USB versions should be available as you read this.) The unit's backlight requires +5V. We easily drew power from a hard drive power connector using a supplied adapter cable.

If your PC lives under your desk rather than up where you can see it, you obviously won't want to install a display in a drive bay. Dave Williams, a systems analyst in Liverpool, England, built a custom mount for his LCD to place atop his monitor. Williams authored an article on the customization that you can read at www.bit-tech.net/article/43.

Once a display is installed just so, next comes the fun part: tweaking the display's output. There's a wide variety of driver programs that can fill your LCD with information instantaneously.

Williams uses a shareware program called LCDC (lcdc.planetdps.com) to drive his display. "This program is very configurable and customizable with the use of plug-ins and can, on displays that support it, set outputs and read keypads," says Williams. (Some LCDs include a small keypad that can serve as an alternate input device.) Williams usually uses the LCD to show

hardware information, such as uptime, temperatures, and network-traffic stats.

Crystalfontz offers free CrystalControl software that can display such system information as drive capacity, processor usage, and the number of email messages in your POP account. The software can also fetch data from other programs. For example, with help from Motherboard Monitor (mbm.livewiredev.com), the software can display system temps, voltages, and stats about network packets transmitted and received. You can also monitor your SETI @home stats and game-server happenings.

Other software to consider includes LCDriver (lcdriver.pointofnoreturn.org), LCDMax (www.lcdmax.de), and LCD Driver Daemon (www.2morrow.com/lcdd) for Windows and LCDproc (lcdproc.omnipotent.net) for Linux. Specialized programs include a Winamp plug-in (www.markuszehnder.ch/projects/lcdplugin) that shows playing MP3 titles and LCDUmeter



Dave Williams' LCD display, which typically displays CPU hardware stats, sits in a mount that he custom made.

(www.geocities.com/special_4k4), which shows a network-traffic graph.

LCDriver is freeware but is closed-source. Version 2.0, available soon, will be open-source and include a bevy of new features, says Ryan Myers, the program's creator. "One feature that everyone is clamoring for is parallel support. A lot of companies make displays that use a parallel protocol," says Myers. "They usually sell for dramatically cheaper than serial displays. The problem is parallel is a lot harder to

wire up; you have to solder it yourself to the parallel port."

Myers has two serial displays on his PC; a VFD displays such stats as memory usage and CPU temperature, and an LCD shows Winamp and Counter-Strike stats.

Hot Now Cool After

Keeping a PC cool while it's running is a popular pastime for overclockers, who employ fans, water pumps, giant copper heatsinks, and other gadgetry to do so. Unfortunately, when the power goes out, these devices stop, leaving the PC to slowly cool down on its own.

IOSS International (www.ioass.com.tw) aims to help with this. The company's \$25 Cooling After product runs the PC's fans as long as 10 minutes after shutdown, providing extra time to dissipate heat.

The fans run at a reduced speed for one, three, five, or 10 minutes, depending on the device's jumper settings. During that time, the PC's power LED blinks to indicate it's in cool-down mode. The company states that "the gradual cool-down protects the electrical components from any damage that a sudden shutdown may cause."

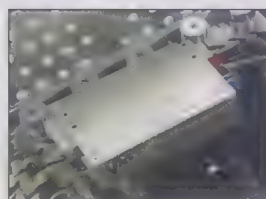
Your PC needs a WOL (Wake on LAN) connector on the motherboard for Cooling After to draw power from to run one or two channels of fans at as many as 12 watts per channel. (The device can power any 12V appliance, such as a water pump.)

In a test described at www.overclockers.com/articles612, Joe Citarella found his AMD chip cooled an additional 4 degrees Celsius with Cooling After than without. The majority of the cooling occurred after three minutes of power-off fan time.

Cool Hand Luke

While we're on the subject of cooling, isn't it time your computer returned the favor? Erlend Thorsen thought so. He inserted a small fan in a standard mouse, drilled ventilation holes, and voila, he had a mouse to keep his hand cool.

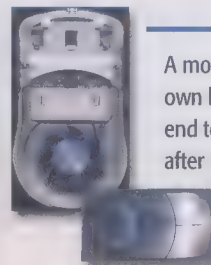
+5 volts from a PS/2 port powers the fan, but Thorsen says you can get power from a serial or USB connection, too. He also added two LEDs to the mouse's front.



The Cooling After device keeps your PC's fans spinning for several minutes after you power down your PC.

He admits the result, which resembles headlights or mouse eyes, is over the top, but if things get too cool or bright, a switch lets Thorsen turn the fan and lights off. A description of the project is available at www.overclockers.com/tips967.

"Going to a LAN party, there is always 'the new



A mouse modded with its own built-in fan can put an end to sticky, sweaty hands after long hours of fragging your friends.

kid.' So it's the welcoming round, handshakes and all. It's with pride and great confidence I can now present a cool and sweat-free hand to welcome new members. . . ." says Thorsen.

For further inspiration to cool off via your mouse, check out this Finnish Web page: http://hw.metku.net/rottaflekti/index_eng.html. **CPU**

by Kevin Savetz

Infinite Loop Gender Benders

Ladies, it's fair to say that the guys may be blowing smoke when they say they don't like to shop. According to a recent AT&T Broadband survey, 58% of the male participants expressed an interest in shopping online, compared to 42% of the female participants.

On the flip side, ladies, you can no longer say that playing games isn't something you like to do either. The same survey found that 51% of the female participants expressed an interest in playing online games with someone in another city, compared to 49% of the male participants.

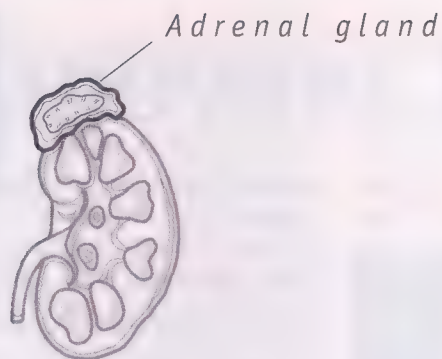


fig. 1



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Company (if using business address)

Address

Address

City/State/ZIP

City/State/ZIP

Phone (with area code)

Phone (with area code)

E-mail

E-mail

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Technically Speaking

An Interview With Ransom Love, Co-founder & Former CEO Of Caldera

Ransom Love recently stepped down as CEO of Caldera (now The SCO Group [www.thescogroup.com]), the company he co-founded, to work more closely with UnitedLinux (www.unitedlinux.com), a collaboration of The SCO Group, Conectiva, SuSE, and Turbolinux. Love, a strong proponent of the open-source movement, recently took some time to discuss open source and the changes occurring among Linux-related companies. ▲

by Kyle Schurman



CPU: In regard to the recent management changes at Caldera/The SCO Group, including the naming of Darl McBride as CEO and president, what is your title now, and what are your responsibilities with The SCO Group?

Love: I don't have an official title, but I'm the executive liaison to UnitedLinux. So I'm working with UnitedLinux trying to put together all of the pieces to try to make UnitedLinux a viable entity. It has such incredible potential, but it's right at the [key] stage. All four of the companies are so busy still running their day-to-day businesses, and yet we have to form this new company, basically with united programs and go-to-market activities. So I'm taking my background and expertise and hopefully providing some assistance there.

CPU: What was the reasoning behind naming McBride CEO?

Love: Darl has had some wonderful experiences with channel companies and innovative ways of invigorating and stimulating and moving channels, making them very productive and effective and efficient. So he has a very strong

background here. Personally, I felt he could help take care of it. We're right at that stage now, we've got the global infrastructure now, but how do you stimulate it, how do you move it to gain its full potential? I think Darl has some good background there.

CPU: Discuss why you like open source. What one factor sold you on open source and Linux?

Love: The strength of open source is that it is a collaborative model. Two minds are always better than one, and I am a big fan of councils. We have family councils and business councils. Councils are not committees. The person who heads the council must make the decision, and everyone on the council must support it for having the privilege of participating in the decision. In every council I've ever participated in, I've been able to make far better decisions because of the broader perspective I've left with. I think open source enables

that for the software development scene. I believe that's what's exciting about UnitedLinux, frankly, because we're now trying to apply that to the business model, not just to the development model. As far as Linux itself, what attracted us to Linux originally was, number one, this collaborative effort. We knew there was no way you could compete doing business the same way it was always done, in a proprietary way, trying to compete against the Microsofts. But a collaborative model could really work. The second thing was, frankly, Linus Torvalds and his personality. Linus is a very pragmatic, very open-minded, very approachable individual. There were other options at the time, but those heading them up did not have the same kind of personality. It's more a people issue than it is technology; it always is.

CPU: Skeptics say companies that emphasize open source never can turn a significant profit. How do you balance The SCO Group's need to be profitable with utilizing the benefits of open source?

Love: What the GPL and some of these other licenses are dealing with is how do you create, protect, and develop a model. But it's not how you create a successful business model that can help fuel the ongoing collaborative development. Development is only, what, 20% to 30% of the cost of a product? The rest of the product costs stem from marketing, sales, collateral, and all of the other efforts that are 80% of your cost. So, clearly, open source is not free software, and it never was intended to be, quote, "free." But you have to come up with a model that makes sense, so you can drive a profitable business with open source. People can have the open source if they want it; if they want it certified, they're going to pay more for it. I think there's ways to come up with a very, very positive [business model] that doesn't detract or take anything away from the open-source model, but now provide open source with a meaningful business model. It's not a charity case.

CPU: In an interview last year you said your biggest concern was maintaining compatibility in your company's products with Microsoft products. Do you ever feel products are hindered by this need for compatibility? Do you see a time where compatibility with Microsoft products won't be needed?

Love: First of all, I think it's not so much [the] company that is hindered; it's the poor customers who have to utilize both who are hindered. So, yes, there are challenges still as you try to work with products that are not standards or are not based on standards. Is it something that we're going to immediately solve? No, and not in the foreseeable future will we not have to have interoperability and compatibility. I think Microsoft is kind of like the big lie that says: Buy our products and go completely Microsoft, then you don't have to worry about the interoperability issue. Well, just

try to run Microsoft products with Microsoft products. I mean, they're just as bad, if not worse, with the incompatibilities between versions and products and different things. So the interoperability is an issue that I think will be with us for some time. Frankly, I'd rather address that issue than be beholden to one single company.

CPU: You have a bachelor's degree in international relations and an MBA. What drew you to the high-tech industry, and what made you stick with the high-tech companies?

Love: I actually got my education after I was already involved with the high-tech industry. I went back to school later in life and finished up and got my degrees. The real answer is there is a constant need for a real opportunity to innovate. I love to solve a problem. I love to work on it and see what I can do to create a solution that's viable—a win-win situation. That's very motivating. Clearly we have a need there.

CPU: You co-founded Caldera in 1994. What made you decide to start the company, and what were your expectations in the beginning? Has the company met them?

Love: What made us decide to start the company was that Novell didn't want to continue with [the development of open source and networking tools]. We knew that the ideas and concepts were incredibly valid. The whole open-source-Linux movement we knew had an opportunity of changing the industry and modifying it. Our whole goal was to create an alternative business platform, not just have it be accepted by a lot of the enthusiasts in the marketplace, but actually make it a reality in business. Have we met that? I think with the announcement of UnitedLinux we have clearly laid the foundation. I think we're beginning to answer some of the key questions of how do you make open source a viable business model. Again, it's using the very principles and

concepts of open source, which is a collaborative business model, to say, "You know what, there's more than enough for all of us to make each of our companies successful. We can do more together than we can apart." The answer is, yes, I think we are fulfilling our dream.

CPU: Caldera went public with a stock offering in 2000 that, unfortunately, mirrored the ups and downs of the tech stock climb and crash. What was the biggest benefit of being a public company?

Love: Clearly you play in a different arena when you're public. You're able to partner with and even acquire companies that you just can't do as a private entity. After going public, we did acquire SCO. Now SCO had tremendous problems that we have sorted through over the last 12 months. But it's probably again this worst-is-sometimes-the-best scenario. We have global infrastructure, which we could not have acquired in that same period of time any other way. I'd have to look back and say, while it's been difficult and tough, that we did learn a lot, and it still couldn't have been done any other way.

CPU: The bottom-line financial news for Linux-based companies hasn't been good in recent months. Do you foresee a major shakeup among companies in the next six to 12 months? What is The SCO Group doing to ensure long-term viability?

Love: I think the answer here is what we've done with UnitedLinux. It's again applying principles that we have all based our businesses on to the business model itself. I think you'll see a lot of collaborative efforts. You'll see a point where it's almost a single go-to-market activity. We have a lot of work to do, but that is clearly the dream and the vision. There are a lot of bright people in the four companies working to make that happen, and hopefully soon there will be more than four companies. **CPU**

To read our entire interview with Ransom Love, go to
www.smartcomputing.com/cpumag/nov02/love

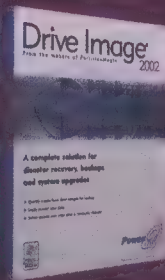
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PROVEN SOLUTIONS FOR STORAGE MANAGEMENT

Under Development

A Peek At What's Brewing In The Laboratory

Fresh from the most influential R&D labs around the world, here's a glimpse at some of the technology that scientists, lab techs, and researchers are cooking up for the future.

Talk To The Car, The Hands Are Busy

Voice recognition in cars isn't exactly novel. Several late-model vehicles now feature very limited voice control, and even Microsoft's doomed Auto PC platform enabled a roughly 200-word vocabulary. Now Honda has announced a partnership with IBM to integrate Big Blue's popular ViaVoice technology into its vehicles. What makes the development interesting is that unlike preceding voice-controlled auto efforts, Honda's move won't cost you an arm and a leg to obtain. In fact, the telematics package is coming as standard equipment on mere Honda Accords, specifically V4 models equipped with leather interiors and all V6 models.

The Talk by Voice technology is linked to the Accord's DVD/GPS navigation

system. The driver presses a Talk button on the steering wheel and then gives commands such as "find the nearest ATM" or "find the nearest Japanese restaurant." Driving instructions play over the car's speaker system and also display on the 7-inch split-screen LCD, which shows a flat map view and a 3D turn-by-turn mode. The Accord's Talk by Voice recognizes roughly a 150-word vocabulary spoken in virtually any English language accent, which is a significant advance over previous small-scale voice-recognition systems.

"One of our development targets with the new Accord was to raise the vehicle to another level while maintaining roughly the same price range," says Art Garner, Honda



press relations manager. "Voice recognition has progressed to the point where it is available for a vehicle like the Accord and adds a great deal of perceived value to the car."

Another nifty feature is that if the car's GPS antenna signal is blocked (perhaps from passing a tall building or entering a tunnel), a built-in gyroscopic sensor and speed detector keep track of the vehicle's location so that map positioning stays current and you don't miss that critical left turn for Starbucks. ▲

Moving To Magnetic Chips

Magnetic storage is old news, but actually computing with magnetism is another matter entirely. Dr. Russell Cowburn's team in the Department of Physics at the University of Durham are working to replace today's electricity-based chips with chips based on magnetic forces.

Rather than pass electrons between transistors over wires, Cowburn's experiments perform operations directly on the electrons' magnetic state (or spin). His group recently published an article in *Science* detailing its ability to perform NOT operations, or switching a 0 value to 1 and vice versa, on electrons. This may only put magnetic chips

where conventional chips were in the 1960s, but it proves magnetic chips are feasible in theory.

Magnetism has several advantages over modern electrical circuitry. Much less power is used in magnetic operations, which will become increasingly important as processor cores grow more powerful. Similarly, in principle, magnetic operations require only a few atoms of space, far less than modern silicon-based wires and transistors. And because the magnetic change persists



when no power is applied to the chip, future processors may act like flash memory and retain their information when turned off.

"We've achieved the sort of computing functionality usually associated with conventional microelectronics—shift registers and NOT gates—but without using a single transistor," says Dr. Cowburn. In addition, Cowburn says, "... we think there's huge potential in this new technology for low-cost, low-power applications, such as smart cards and integrating microelectronics into clothing or even the human body." ▲

Hot Chips, Happy News

If you've been forced to buy special foam pads to protect your lap from that toaster of a notebook, or if you've purchased a special tower with 10 fans and a water-cooling system to keep your ultra-stacked PC operational, keep an eye on ENECO (www.eneco.com). Working with Dr. Peter L. Hagelstein, a MIT professor of electrical engineering, ENECO has developed the first generation of rudimentary thermal diodes, or small devices that take heat and can either convert a portion of it to electricity or use it to chill the heated surface. Thus, a thermal diode might use your notebook CPU's heat to help charge the battery or use your desktop CPU's heat to run the on-processor cooling system.

The science behind ENECO's technology dates back to a discipline called thermionics, which involves two conductive plates separated by a vacuum space. Thermionics was practiced in a vacuum tube, with electrons jumping from the

cathode, crossing the vacuum, and being absorbed by the cooler anode. Electricity is generated as the electrons traverse an electromagnetic field present in the vacuum space. ENECO's updating of thermionics replaces the vacuum with a solid-state semiconducting apparatus. The result is what ENECO calls a "thermal diode."

The laws of physics dictate that it's impossible to get complete conversion of heat to electricity. At best, theories show that a roughly 50% conversion is possible, although the best current approaches can still only obtain 10% at very high temper-

atures. ENECO's thermal diodes are meant to operate at only 200 to 450 degrees Celsius, which is typical in many electronics and power-production environments. At 450 degrees Celsius, ENECO expects to achieve greater than 20% conversion efficiency.

"Used on the Cooling Mode," explains Lew Brown, ENECO president and CEO, "our thermal diodes can be incorporated inside the package and can be placed in intimate contact with the critical component to actively transport heat away from the target area instead of allowing passive conduction through the package. There is a cottage industry at present in devices to allow overclocking by enhancing package cooling. That approach is equivalent to air conditioning your house to keep the milk cool. Incorporating active spot cooling is like putting the milk in a refrigerator."

Brown says that ENECO should have products ready for market in three to five years. In addition to microelectronics, cooling applications could include microscopes, handheld instruments, and laser equipment in fiber optics. Power-recovery applications could appear in mobile electronics, but Brown expects wider adoption in "off-grid" areas where there is little external power, such as in outer space and deep-ocean environments. For the environmentally minded, perhaps of most interest is that thermal diodes create no hazardous by-products, although present designs involve manufacturing with some toxic materials. ▲



Thermal diodes may one day help convert heat into electricity that entities can use. ENECO has developed the first-gen of such diodes.

Robots Learn To Take Wing

When lizards evolved into birds and took to the air, the process took millions of years in Darwinian trial and error. When Krister Wolff and Peter Nordin of Chalmers University of Technology in Gothenburg, Sweden, decided to see how long it would take a robot to learn the process of flying, they hoped for a significantly shorter timetable. What they didn't anticipate was that it would take only three hours.

Their robot sported 3-meter wings made of light balsa wood covered in thin plastic film. The machine was mounted between two vertical rods and suspended by an elastic band. A computer fed the robot 20 random motion-related instructions per second, and any lift of the rods was measured and taken as a sign of successful flapping.

At first, the robot only twitched and jerked helplessly, not knowing which movements would help fulfill its uplifting objective. However, successful techniques were remembered, improved, and soon enough the robot would turn its wings 90 degrees, raise them, and thrust them back into the horizontal position with a very recognizable flapping motion. Wolff and his team had liftoff.

Wolff says he was surprised how quickly the robot ascertained the correct flapping motions. He notes that the mechanics of the machine—making the robot light enough to gain altitude—was the project's biggest challenge. Unfortunately, the robot is still far too heavy to attain actual flight. Wolff says he may continue the work in the future and strive for a lighter, flight-worthy creation, but for now the experiment marks a milestone in the application of artificial intelligence to master traditionally biological processes. ▲



Back Door

Q&A With Bob Metcalfe

Forget the stereotyped image of technology inventors as soft-spoken, reclusive jarheads. Bob Metcalfe may have invented Ethernet and founded 3Com to popularize it, but he is far from being a stereotype. As a prominent columnist throughout the '90s, Metcalfe was notorious for his inflammatory predictions. Now a venture capitalist, he carries on the quest for discovering new technologies and advancing the world of computing.

Q What was it like working for Xerox PARC in those early innovative days?

METCALFE: Heaven on earth! Some people referred to Boggs and me as the Bobbsey Twins. We worked together constantly. We would work until we got tired and then we would go home and then we would wake up and go to work, whenever that was, and then work until we got tired. This cost me a marriage. By 1975, my then-wife had grown tired of that s**t. On the other hand, it was a great life. The one complication that we had in our lives was that the Xerox Computer Science Lab required us to show up every Tuesday at noon for a meeting. So we had to arrange our schedules so that we were awake during that period. [laughs]

Q As a trade pundit, do you feel that people listened to you? Did you make a difference?

METCALFE: Yes, I was fabulously successful as a pundit. In the end, I was writing a weekly column for an average weekly readership of 629,000 technology professionals. I was organizing conferences and giving speeches. I had my own Webcast. Attracting readers or participants was my measure of success, and I did that. I learned that it's much more important to be interesting than to be right. There's a better way to put this. Freeman Dyson said, "It is better to be wrong than to be vague." So I got in the



habit of making very precise predictions because they were interesting.

Q Such as?

METCALFE: I predicted that the Internet bubble would burst on Nov. 9, 1999. And I was right. I was just off by four or five months. So I generally get credit for having been right about the bubble bursting, but everyone knew it was going to burst. I just wrote it down.

Q Why did you predict in 1995 that "the Internet would collapse"?

METCALFE: Now you're going to have to buy my book called "Internet Collapses." Notice it's plural. And if you'll read the columns that are gathered there about the subject, I really predicted collapses of the Internet. And I defined the term "collapse" to be a huge outage. I predicted that there would be huge outages and that there would be a really big one in 1996: a "gigalapse," I called it, which is a billion lost user hours in a single outage. And that's what I was wrong about. The largest recorded outage that year was on Aug. 7, and it was a 118 megalapse, about an eighth of the size I predicted. And in the column in which I first made this prediction, of course, there was

some humor. Various wags quoted certain sentences from that initial column, which was mostly tongue-in-cheek, and used that to be my prediction, which I was wrong about. But it wasn't that the Internet was going to literally go away but that it would suffer continuing outages. Of course, outages have been a problem with the Internet—much less so than I thought, but still. . . . The Internet still has some fragility, and there are outages every day of various sizes. So it's inevitable that there'll be a gigalapse someday.

Q You think that wireless is going to be the way to go in homes?

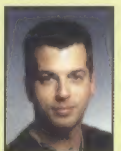
METCALFE: Well, it happened to me in a funny way. My home is wired for Ethernet, but my wife got herself an AirPort, started wandering around the house with her Titanium Macintosh, sitting in bed reading her email and stuff. Dammit if she didn't convince me. So now my kids all access the Internet wirelessly. I'm still wired, but it's just because I'm too bothered to unplug.

Q What's next for Bob Metcalfe?

METCALFE: Well, I've just started learning to be a venture capitalist. I was a half-time VC all of last year, and I've been a full-time VC since January. I've got another 15 or 20 years to go. Well, 10 years is my normal attention span, so I've got 10 or 15 years to learn it. My aim is to be the best venture capitalist in the world. That's what's next for me.

For our complete interview with Bob Metcalfe, go to www.smartcomputing.com/cpumag/nov02/metcalfe.

William Van Winkle began writing for computer magazines in 1996. He was first published in 1990, the same year he took his first job in computers. He and his family live outside of Portland, Ore.

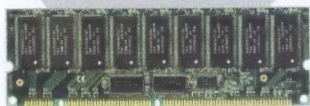




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